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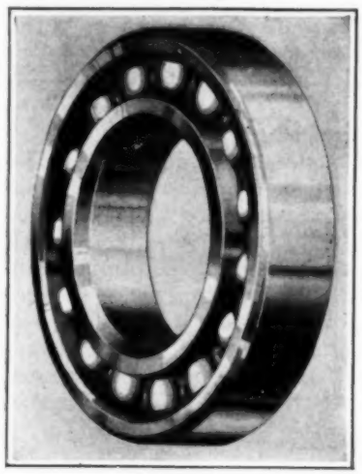


FORGING Races for Ball Bearings

By John C. Kielman
Engineer, Forge Plant, New Departure Manufacturing Company

Erosion of the Dies Is the Greatest Difficulty

BY FAR the greater number of races for the millions of ball bearings that are produced annually, are forged by the "upset" process. Mechanical pressure is brought to bear upon the end of a red-hot bar, causing the plastic metal to flow until it fills a recessed space in which the end of the bar is confined. Given a machine capable of making the few necessary movements and fitted with dies formed to suitable shapes, this would seem to be a very simple operation, yet so many obscure conditions affect the result that eternal vigilance must be the watchword of him who would produce a reasonably full quota of acceptable forgings. The forging machines — necessarily massive in order that they may withstand the enormous pressures involved—comprise two active members; a transversely moving slide to grip the bar and hold it against endwise pressure, and a "header" slide, moving in a direction parallel to the center line of the bar, to deliver the pressure necessary to flow the metal into the recesses of the dies. A forging unit consists of a machine and a furnace —often two furnaces—to heat the bars. One operator and a helper constitute the working crew of each unit, with relief operators ready to take over the duties of anyone obliged temporarily to leave his position at the machine. In the illustration, Fig. 1, may be seen one of the forging machines and its furnace in the forge plant of the New Departure Manufacturing Company, Bristol, Conn. This unit, like most of the larger ones, has two furnaces; the second furnace being in this case

Fig. 1—The large forging machines stand between two furnaces and each furnace is served by a separate jib crane, so that heated bars may be taken from either at will. From two or three to a dozen rings are forged from a bar at one heat, depending upon the size of the bar

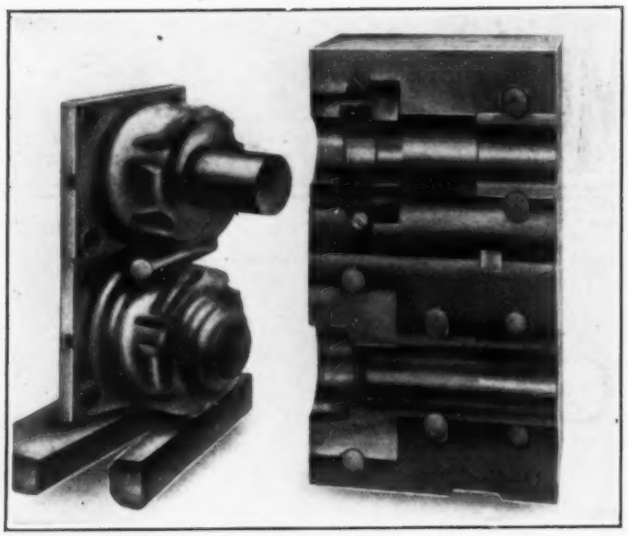


Fig. 2—The upsetting punch and die and the gripping die are made of tungsten steel in order to resist the heat of the work, with which they are almost constantly in contact. The remaining tools are made of high-speed steel

at the right, but just beyond the scope of the picture.

Dies to grip the bar and to form the rings are made in halves, as the complete die must be capable of opening to receive the bar and to discharge the forged rings. One half of the die is secured to a stationary jaw of the machine while the other half is carried by the opposed end of the tranversely moving slide. As a matter of economy in the use of expensive material as well as of convenience in making them, the active parts of the dies are made separately and are secured in die-blocks made of a cheaper grade of steel.

One such block, with the active dies in place, may be seen in Fig. 2, together with the upsetting tool and piercing punch that are secured separately to the header slide. The several parts of the active dies are made as round bushings with bores recessed and chambered to the required shapes, and are fastened in suitable pockets in the die-block by means of round-head bolts that pass through the block.

The outlines of the several parts are easily traceable in the illustration. The preponderance of pressure is delivered toward the right as seen in the illustration and is resisted by the shoulders at the bottoms of the pockets in which the principal parts are secured. The round heads of the holding bolts act as dowels to prevent the dies from being pulled out of place in the opposite direction as the punches withdraw from the forgings.

The active parts of the dies are made of tungsten steel, for the reason that this steel possesses the necessary property of resistance to heat, commonly called red-hardness. Not only is the material upon which they do their work heated to a temperature of 2,000 deg. F., but the dies are in contact with this hot metal for an appreciable length of time in each cycle.

The heading punch is also made of tungsten steel for the same reason, though the wear upon it is less severe than upon the die. The piercing die and stripper—which is the upper member to the left as shown in Fig. 2—can be made of any good high-speed steel, as the pressure exerted by this part is inconsiderable when compared with that upon the heading tools and gripping dies.

In Fig. 3 may be seen one of the heading dies and a blank from which it is made. The blank is first sawed apart diametrically and the halves temporarily rejoined by bands that encircle the blank while the lathe work upon the bore is being done. With a plug arbor inserted in the finished bore to act as a dowel the outside diameter may then be turned over the whole length by shifting the band after a part of the length has been reduced to size.

To forge a ring in the machine, the heated bar is placed in position before the stationary half of the lower die with its end abutting against a movable stop, the position of which determines the amount of stock necessary to fill the upsetting die, and the treadle is depressed to start the machine in action. The opposed half of the upsetting die and the gripping die behind it move forward to enclose and seize the bar, and the movable stop swings out of the way of the heading punch as the punch is advanced by its slide to upset the bar and cause the plastic metal to fill every part of the die.

As the punch recedes and the gripping die releases it, the bar presents the appearance shown in Fig. 4. The bar is immediately raised by the air hoist to a position before the piercing die and the machine again treadled; whereupon the die closes upon the bar and the piercing punch comes forward to pierce it out of the forging as in Fig. 5, leaving the completed ring to drop out as the dies reopen. The number of forgings that can be made at one heating of the bar depends somewhat upon the diameter of the bar and may range from three or four to a dozen or more. The limit is set by the cooling bar, as the allowable forging range is not more than 50 degrees.

It is obvious that the bar can never be larger than the hole in the ring, hence it is necessary when making rings in which the hole is small in comparison to the bulk of the forging to "gather" a considerable amount of stock in the upsetting operation. An undue length of bar projecting from the gripping die, however, is apt to "buckle," resulting in a flow of metal outside the die on one side with consequent failure to fill out the ring on the other side. Therefore such rings are forged in three stages, in the first of which the flowing metal is confined by the tapered hollow punch to be seen at the bottom of Fig. 6 and is partly upset to a shape that when placed in the second upsetting die, will spread uniformly to fill the die without overflowing.

At the beginning of this article it was intimated that the forging of acceptable rings by this process is not as easy as it would seem to the casual observer. Right at the start the forging temperature must be closely controlled, and to that end there is in this plant an inspector

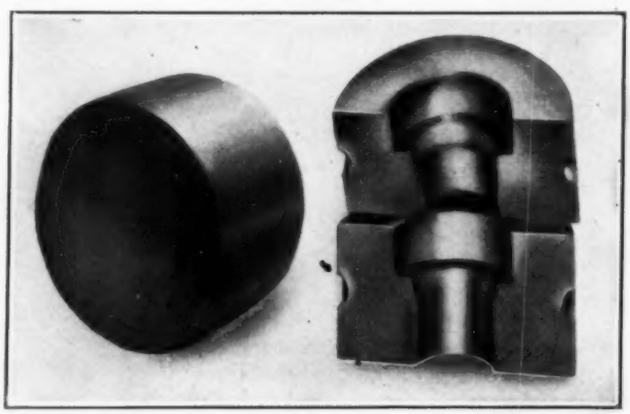


Fig. 3—The dies are necessarily made in halves. The blank is first sawed in two diametrically and the halves are temporarily joined together by clamps to hold them as one piece, while the lathe work on the bore is being done

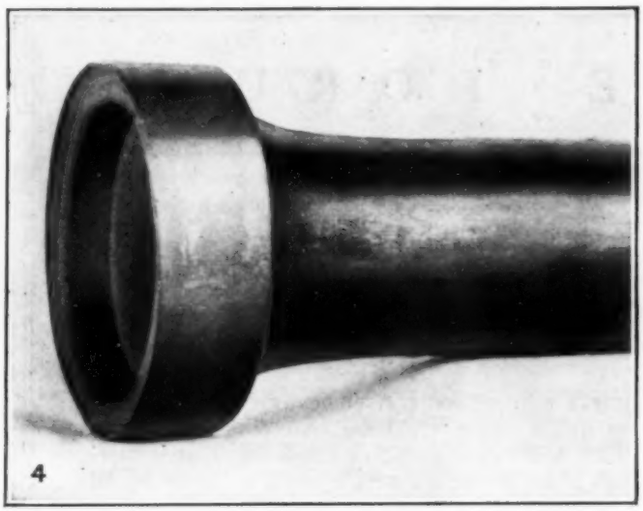


Fig. 4—The upset bar is shown as it appears when released from the gripping dies. Note that the recess formed by the upsetting punch is larger in diameter than the bar.

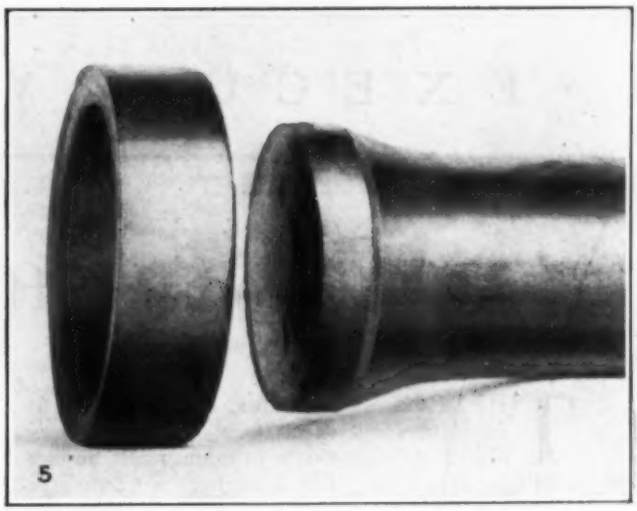


Fig. 5—The bar is raised immediately by the air hoist so that the enlarged end is enclosed by the piercing and stripping die when the header slide of the machine comes forward on its next stroke. The piercing punch merely pushes the bar out of the ring

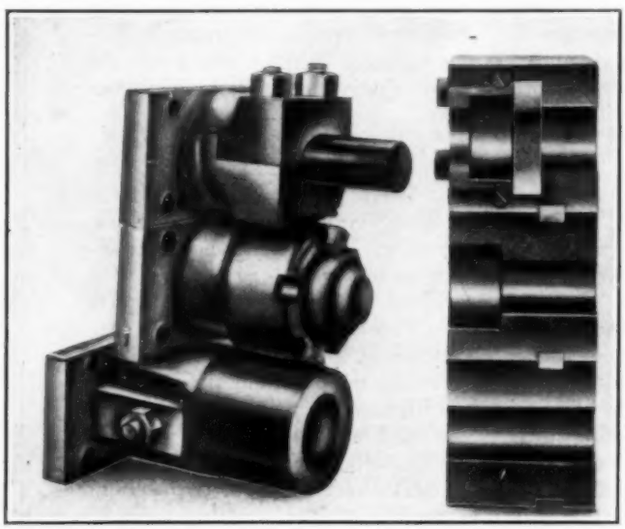


Fig. 6—Some rings are large in proportion to the size of the bar from which they are forged, making it necessary to upset them in two stages in order to prevent the bar from buckling and thus producing a lop-sided ring

whose sole duty it is to observe the heats of the furnaces with an optical pyrometer, and to compare his findings with the temperature shown by the registering pyrometer with which each furnace is equipped.

Having made sure of the heats, the next difficulty to guard against is the erosion of the tools. Because of the tremendous pressures brought to bear upon them, the scale that cannot be avoided, and the fact that the tools themselves are necessarily at high heat, excessive wear is to be expected. Then, too, a set-up that produces acceptable rings at the start may not continue to do so, by reason of misalignment due to expansion of the tools and the parts of the machine to which they are attached. Hence it is necessary to watch closely the product of a machine newly going into action and to make slight readjustments from time to time.

It might reasonably be supposed that arrangements could be made continuously to cool the dies by flowing water upon the die-blocks. Though this is done successfully in some forging operations it is not practical here, principally for the reason that the water would seriously affect the forgings by chilling and cracking the temperature-sensitive high-carbon chrome steel of which they are made.

Normal wear of the upsetting die causes it to increase in diameter as the work proceeds, hence there will be a gradual increase in diameter of the forgings which must be compensated for by slight adjustments of the stock stop, else the rings will not fill out properly. Such increase brings prompt reaction from the piercing and stripping die, which in closing upon the larger rings tends to squeeze them out of shape, causing fins and badly centered holes. It is customary to make the diameter of the stripping die slightly larger than the first rings produced by a new upsetting die in order to delay this trouble as long as possible, but if this is overdone the rings are likely to be distorted by the piercing punch.

Wear — particularly if uneven — upon the internal shoulders of the upsetting die is a prolific source of trouble. This causes the end of the bar to be forced to one side in upsetting, with the result that the metal flows out around the punch on that side, while the ring does not fill out on the other side. This trouble increases rapidly as wear progresses, for the reason that pressure of the upsetting punch is not centralized and there is increasing tendency for it to crowd to one side.

Wear upon the corners of the upsetting and gripping dies is likely to produce fins upon the bar, which in turn causes trouble in forging subsequent rings and also induces slippage in the gripping dies.

Variations in temperature of the stock affect the length of the forgings for the following reasons: No matter how ponderous the machine, there is bound to be more or less springing of the frame as the moving part meets with resistance. A very slight drop in temperature increases this resistance to an inordinate degree, hence it is not uncommon to find a variation of $\frac{1}{32}$ in. in length of the rings due to a fall of temperature of the stock of 50 deg. A hot forging also shrinks more than a cooler one. A constant watch upon the product is maintained by inspectors who gage the rings from all of the machines at frequent intervals and notify the operators of any departure from standard specifications.

Patronizing Home Industry

THERE is a drive for home buying in Pleasantville. The local foundries are objecting strenuously to home firms buying castings elsewhere. The Chamber of Commerce has horned in, and now our friend Bill Holland has been asked to sit in on a "talkfest" between the founders and the users of castings.

"I don't see why you can't use local castings instead of sending way out to Ohio for them," said the Chamber of Commerce man to Hartwell of the machine company that bears his name.

"Don't you suppose I'd rather get castings next door than to have them shipped seven hundred miles, Mr. Brewster? But I get better castings delivered at my door for less money than Thompson wants for the same thing. And I get them more quickly, unless there's a delay on the railroad, which isn't often these days."

"I don't see how anyone can make castings any better or cheaper than I do," said Thompson. "We do our best. And I think local business men should stand by one another."

"Do you ever run across cases of this kind, Mr. Holland?" said Brewster of the Chamber of Commerce.

"Very often, Mr. Brewster. It's an old story. I ran across a man in Salt Lake City who bought his castings in Rhode Island—and with reason. He needed a small, fine casting that a foundry, built for ordinary, rough work, could not handle. Unless Thompson can make castings for Hartwell as good as the firm in Ohio, it is his duty to his stockholders and to the town to buy them as he is doing."

"I don't get that," said Brewster. "If he bought here he'd be keeping the money in town and employing more men here."

"Not quite true, Mr. Brewster. For Hartwell would also be handicapping his ability to meet competition elsewhere. As I understand him it isn't only a question of price, but of quality."

"You're right, Mr. Holland. Thompson tells me that you can't expect solid metal in large bosses near a thin section. As long as I believed that, we did a lot of repairing that cost money and didn't suit me at all. The Ohio firm makes castings from the same pattern, and I've never found a blow hole in a single casting.

"You're also right about poor castings being a handicap in meeting competition. When Thompson made the castings I couldn't promise deliveries accurately. Blow holes sometimes meant throwing a casting away after a lot of work had been done on it. They were frequently overweight—and the price was higher. When I lose a sale the town suffers more than when Thompson goes without my orders."

"Any suggestion, Mr. Holland?"

"This sort of thing comes up periodically in every town and county. Patronizing home industries is fine as long as it pays.

"It seems to be up to Thompson to find how and why the Ohio foundry can make better castings and deliver them at a lower price. And I'd lay more stress on the quality than the cost. If he finds that the difference in price is due to Ohio being nearer the coal and iron fields, he may decide to confine himself to work where the tonnage is not heavy and where a cent or two a pound is not so important."

"But what about patronizing home industry, Mr. Holland?"

"If everyone did that, Mr. Brewster, Pleasantville would never sell a dollar's worth to any other town. It may sound fine at a Rotary Club lunch, but business would go to pot if we all tried to practice it."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

Discussion

About Wage Incentives

Where modern wage payment schemes are installed, the incentives to produce are more powerful than those offered under any profit

sharing or co-partnership scheme, as the rewards are immediate and greater and are almost entirely dependent upon the workers' skill and energy.

No wage incentive scheme should be sprung suddenly upon a factory. Every effort should be made to secure the confidence and co-operation of the workers, and it is hopeless to try to make the workers believe that the scheme is entirely for their benefit. It will be wise to state frankly that the scheme is intended to be mutually beneficial. Prior to the introduction of the scheme, the management should guarantee that the time allowance will not be altered unless the material, method, or machinery is changed, and that all improvements suggested by operators will be paid for. Of the various incentives found in practical use, the Halsey system of premium bonus seems to be the one most universally used, and the 50 per cent division of time saved appeals to most operators. —J. W. LIVINGSTON, *Scotland.*

Getting Ideas from the Men

Suggestion boxes have become an accepted idea. In the first place, the box is an outlet for an otherwise muzzled number of workers. By this, I mean that some immediate superiors often have ideas suggested by their help, but they pay no attention unless they can find some way to steal the glory for themselves.

Some firms have gone so far as to place some of their manufacturing problems on the shop bulletin board, and inviting comment through the suggestion box. In our plant, all ideas are carefully gone over, and all are kept in the files under index, unless radical or worthless.

Ideas and suggestions are the stepping stones by which many men rise in the plant to better jobs. This is known, and in itself creates the reward and makes the others do some thinking. It shows how many real thinkers there are in the personnel. —CHARLES H. WILLEY.

The ideas gathered from the workers through the use of suggestion systems have amply demonstrated the worth of suggestion plans. However, if a suggestion system is to be successful, it is essential that it demonstrate to the employees the open-mindedness of the management, and the serious desire for new ideas of the workers, also the willingness of the company to consider thoroughly the ideas that are offered, no matter whether they seem good or bad at first glance, and the intention in any case to let the employee know the decision and the reason for it. Furthermore, that it is the desire of the company to reward fairly the man who makes the suggestion, if there is any value in it.

The best proof that the management wants suggestions is, of course, to use those it gets, when they are worth using. When that is done the news spreads rapidly through an organization. It gives the worker a genuine feeling of pride to point to a machine or method and say, "That's my idea." And if he is rewarded fairly, it is an incentive to others to turn in their suggestions in the same way.

The suggestion system will encourage the workers to submit their constructive ideas. Furthermore, when the minds of workers are turned in the direction of building up there is not much room left for those ideas which tend to tear down and destroy, ideas that often lie hidden, making the workers disgruntled and gloomy of temperment, inefficient of hand, and fertile soil for the seeds of unrest, dissatisfaction, or industrial strife. —S. KUPPER.

Discouraging Cancellations

It is difficult to believe that a stamping manufacturer would embark on a program to produce a half million of special stampings requiring a new set of tools without enough on paper to show that the expense involved in getting ready for the job was understood by both parties, and some provision made to assure Mr. Knowles that a cancellation of any part of the quantity would not leave him high and dry, facing the loss of his investment.

It is possible to build inferior tools and quote a low price, and it seems that stamping manufacturers have themselves imposed the evil of absorbing the cost of tools on the industry, largely because they are afraid to tell the buyer what good tools cost, for fear of being underbid. No one doubts that the cost of tools is in the price of the stampings. Perhaps a low price has forced inferior tools at the start, and requirements have demanded the best under pressure, but always the toll will be exacted.

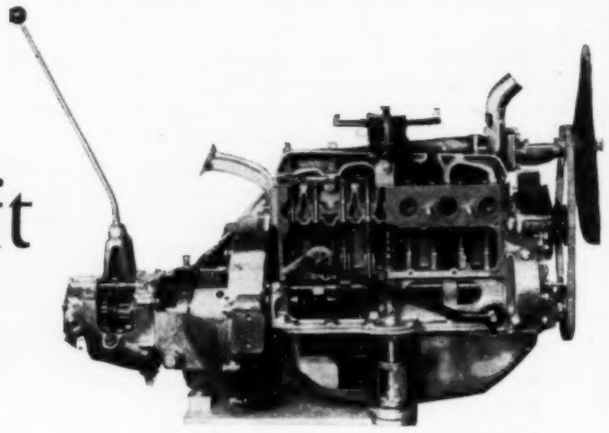
Perhaps Mr. Knowles' customer thinks that the investment in tools was taken up in the first 10,000 pieces. Probably it should have been, but there is not much reason for clouding the issue. The whole matter should have been put down in a contract with definitely worded statements as to who agrees to buy, and who and what are agreed to be made and to be sold. Mr. Holland's solution is the correct one, whether or not there is a contract. An invoice for materials purchased and on hand, for design and building of tools that lie unabsorbed, and for actual non-compensated services rendered up to and including the day of cancellation should be rendered, with full and detailed explanation. —R. I. MINER.

Next Week

Paying Express Charges on Replacements

Equipment Makes Possible the Ford Model A

Crankshaft and Camshaft Operations



By Fay Leone Faurote, M.E.

THE crankshaft for the Ford Model A is made of hot-rolled steel having the following composition: Carbon, 0.35 to 0.40; manganese, 0.70 to 0.90; silicon, 0.07 to 0.15; phosphorous, 0.04 (maximum); sulphur, 0.05 (maximum). The forging is subjected to heat-treatment, being normalized at 1,500 deg. F., cooled in air, and then pickled.

In the manufacture of the die blocks for the Ford Model A crankshaft and connecting rod, the impressions are sunk by Keller engraving or profiling machines. The dies are all made of special-grade Ford die-block steel.

In the case of the crankshaft, the roughing block carries the "break down," the "forming" and the "rough-finishing" dies. The finishing dies for the final restrike in the forging process are, of course, separate sets and are held within close limits to make them interchangeable. When new, these blocks are 12 in. high, and an allowance of about 1 in. is made for re-cuts, of which there are usually not more than four. The blocking die is good for from 15,000 to 20,000 rough forgings, while about 3,000 is the limit for the finishing die. In practice, of course, all the dies are annealed after each run in

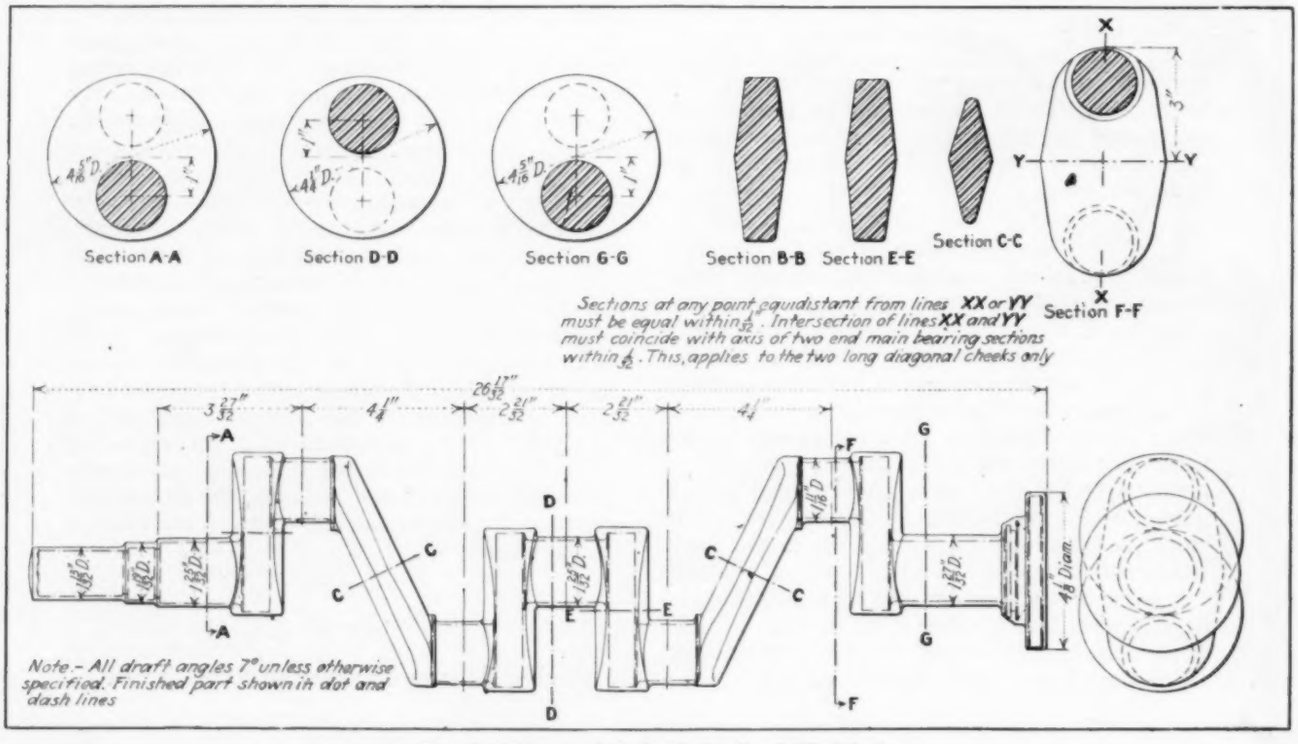

Section A-A
Section D-D
Section G-G
Section B-B
Section E-E
Section C-C
Section F-F
Sections at any point equidistant from lines XX or YY must be equal within 1/32. Intersection of lines XX and YY must coincide with axis of two end main bearing sections within 1/64. This, applies to the two long diagonal cheeks only
Note - All draft angles 7° unless otherwise specified. Finished part shown in dot and dash lines

Fig. 1—The crankshaft of the Ford Model A

Fig. 2—Polishing the crankpins and the main bearings

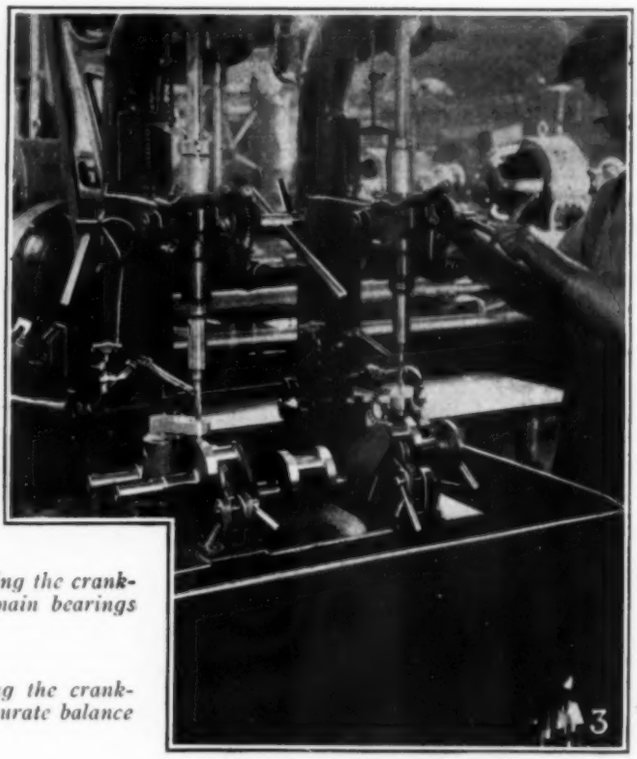


Fig. 3—Drilling the crankshaft to get accurate balance

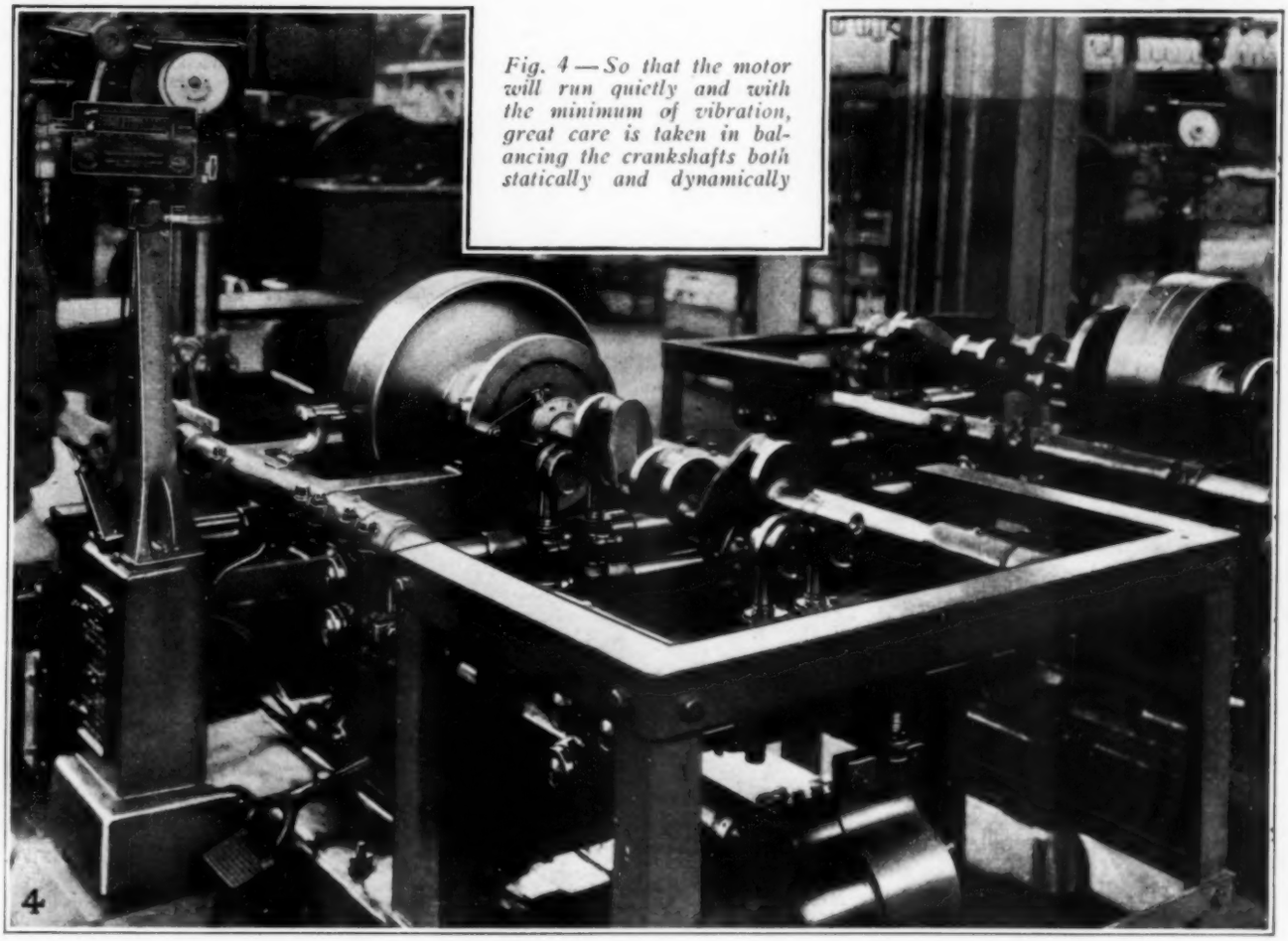


Fig. 4 — So that the motor will run quietly and with the minimum of vibration, great care is taken in balancing the crankshafts both statically and dynamically

the hammer shop and are rehardened before being used.

The die blocks are normalized at 1,560 deg. F., pickled in sulphuric acid, quenched in caustic soda at 1,500 deg. F. and drawn at 975 deg. F. About 80 per cent of the die work can be done with the Keller machines, some hand work by skilled die makers being required to complete the job. By the use of these machines all preliminary layout work is avoided, once the templet has been made. The machines feed automatically both ways and are so sensitive that the slightest change in surface readily operates the relays, which in turn control the feeding mechanism behind the rotating cutter. By using an outlining templet in addition to the hardened steel master, the Keller machines have been made to do such an accurate job that about two-thirds of the usual bench work has been eliminated.

The connecting-rod dies are also worthy of mention. The first hammer carries a block with "fuller," "edger," "blocking" and "finishing" dies and cut-off. In the Model A connecting rod the studs are forged integrally with the rod. A feature in forging the connecting rod, is that all forgings are restruck hot after the forging and trimming operations, and are then retrimmed. The dies for the finishing operation are checked by a master type of the complete rod.

The ten operations necessary in forging, snagging, normalizing and cleaning the crankshaft are given in the following operation sheet:

Crankshaft Operation Sheet (Forging)

	Operations	Machine	No. per Hr.
A	Cut to length	No. 5 Hilles & Jones shear	300
B	Block	5,000-lb. Erie hammer	40
C	Heat and forge	5,000-lb. Erie hammer	40
D	Trim hot	No. 207 Bliss press	40
E	Finish cold trim	No. 76½ Bliss press	75
F	Upset	4-in. Ajax forging machine	100
G	Snag 10%	Model D Norton grinder	40
H	Normalize	Pusher-type furnace	24
I	Pickle	Tanks	80
J	Wire brush	No. 1½ Norton grinder	60

The first machine operation on the crankshaft, which is performed at the rate of 200 per hr., is rough straightening the center bearing on a P-3 Ferracute press. This operation is followed by the straightening of the front and rear bearings, also on a P-3 Ferracute, at the rate of 70 an hr. A special Ford centering machine, disposing of 100 shafts per hr., is used for centering both ends. An inspection for straightness follows. About 40 per cent of the production needs to be further straightened. This operation also is done on a Ferracute press.

The center bearing, 1½ in. long, is spotted and rough ground on a 12x36-in. Landis grinder before heat-treatment. The seventh operation, performed on a 34-in. Wicks crankshaft line-bearing lathe, handling 25 shafts per hr., comprises a rough turn, the filleting of three main bearings, facing of cheeks and the turning of the gear fit. The succeeding 71 operations required to finish the job are as follows:

Crankshaft Operation Sheet

No.	Operations	Machines	No. per Hr.
8	Rough turn pulley bearing	No. 1—6-ft. Reed-Prentice double carriage lathe	40
9	Turn flange diameter and oil slinger	20-in. x 6-ft. Wicks crankshaft flange turning lathe 20-in. Reed-Prentice flange turning lathe	24
10	Rough turn diameter of flange (temporary operation later to be done with Operation 9)	14-in. x 6-ft. Reed-Prentice lathe	100
11	Face outside face of flange	No. 0—6-ft. Reed-Prentice lathe, hand feed, cam-lever tailstock	100
12	Recenter and counterbore 1¼-in. hole	No. 25—24-in. Foote-Burt drill	60
13	Restraighten center main bearing	P-3 Ferracute press	100
14	Drill and ream dowel pin hole to 0.375 in. for locating	No. 23—20-in. Foote-Burt single-spindle drill	60
15	Inspect locating hole and main bearing	Hand operation	...
16	Rough grind front bearing before heat-treatment	No. 22-A—16x32-in. Landis grinder	65
17	Rough grind flange bearing before heat-treatment	12x36-in. Landis grinder	65
18	Inspect line bearings for size	Hand operation	...
19	Rough turn outside diameter of disks	Melling crankshaft contour-turning lathes	35
20	Rough turn four pin bearings and face cheeks	Type CF Melling crankshaft turning lathe	20
21	Inspect line-up of pins and thickness of contours	Hand operation	...
22	Heat, quench and draw	Ford spinning machine	75
23	Grind spot and Brinell test	No. 1 Leland & Faulkner grinder	375
24	Restraighten center bearings on centers	P-3 Ferracute press	150
25	Restraighten front and rear bearings	P-3 Ferracute press	50
26	Inspect for alignment	Hand operation	...
27	Restraighten (partial) all bearings (about 60% of production)	P-3 Ferracute press	70
28	Clean center	18z-742 Ford centering machine	150
29	Drill and ream one 0.436-in and four letter W holes	18z-374 Ford special drilling machines	68
30	Inspect	Hand operation	...
31	Finish cut front end to length	16-in. x 5-ft. Reed-Prentice lathe, power cross feed, oil pan	144
32	Recenter pulley end	No. 23 Foote-Burt drill	100
33	Semi-finish grind gear main bearing to width after heat-treatment	12x36-in. Landis grinder	50
34	Semi-finish grind center bearing after heat-treatment	12x36-in. Landis grinder	60
35	Restraighten center bearing	P-2 Ferracute press	170
36	Rough grind pulley bearing after heat-treament	No. 23-A, 16x42-in. Landis grinder	87

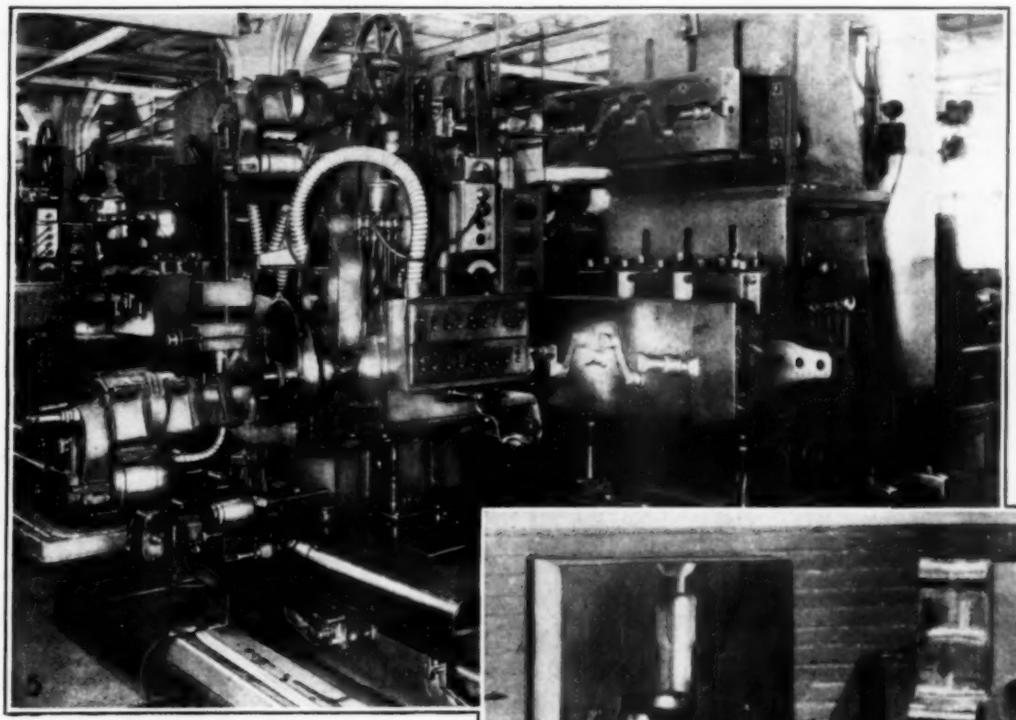


Fig. 5—Keller profiling machine cutting one of the die-blocks for a crankshaft. The upper block is the model, or master, while the lower one is the die-block, in which the impression is being machined. The cutter follows the profile of the master automatically

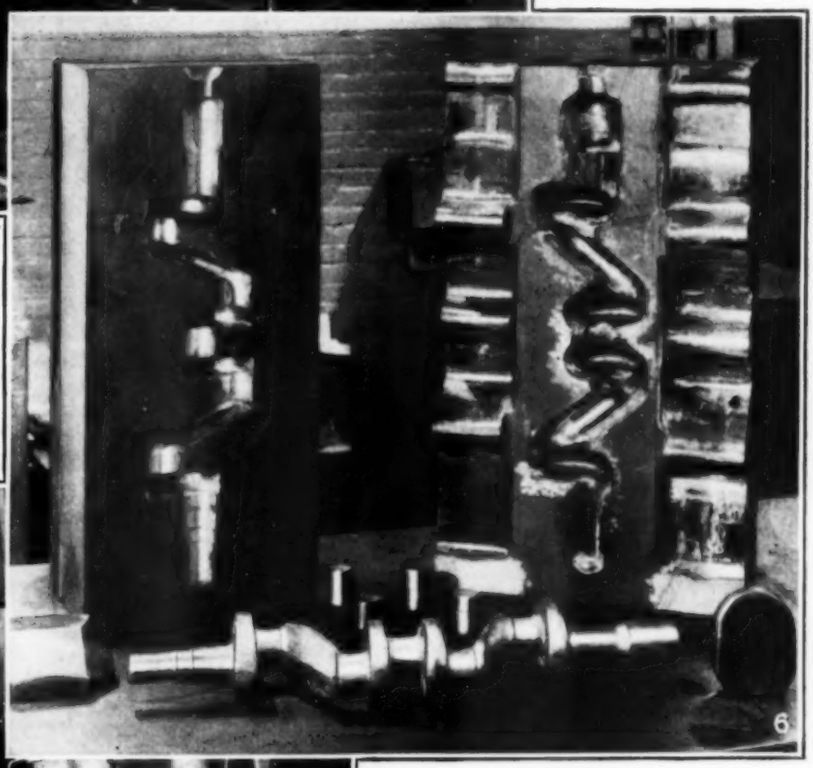


Fig. 6—One of the die-blocks for finish forging the crankshaft can be seen at the left. At the right is one of the rough-forging die-blocks. The crankshaft at the bottom of the picture is a lead proof, made to test the accuracy of the die

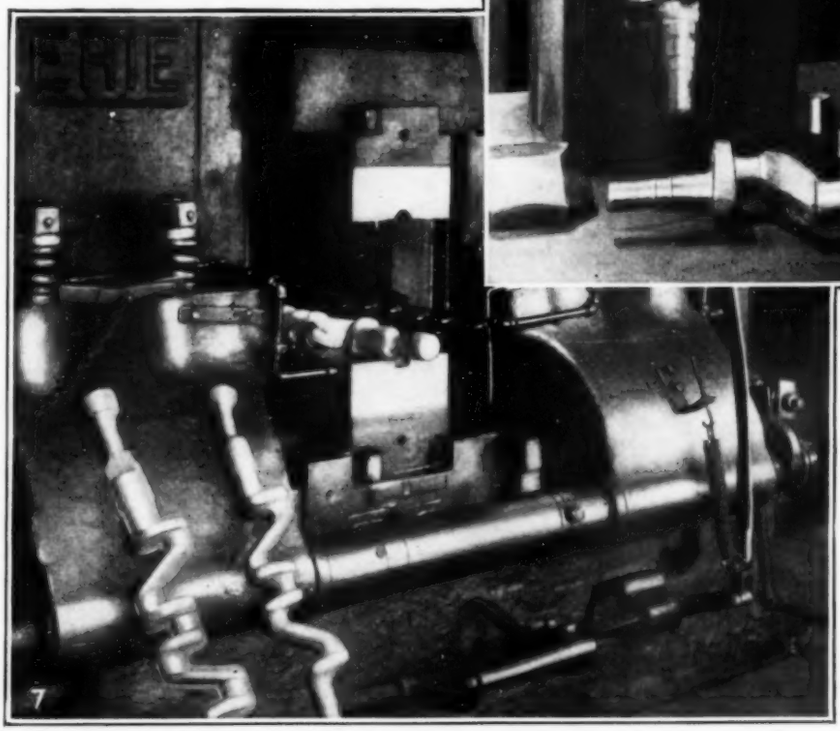


Fig. 7—A very heavy steam drop-hammer is required for forging the crankshafts. The crankshaft lying on the lower die has been rough forged and is ready for the finish-forging operation. In the lower left-hand corner are two crankshafts. The one at the right is a rough forging, while the one at the left has been finish forged, although the flash has not been trimmed off

Crankshaft Operation Sheet (Continued)

No.	Operation	Machine	No. per Hr.
37	Rough grind gear fit after heat-treament	[illegible]-in. Landis grinder	75
38	Semi-finish grind front bearing after heat-treatment	.....	...
39	Semi-finish grind rear bearing diameter after heat-treatment	12x36-in. Landis grinder	50
40	Inspect	Hand operation	...
41	Restraighten center bearing	P-2 Ferracute press	150
42	Finish grind center pins Nos. 2 and 3	16x32-in. Landis grinder with two wheels	28
43	Finish grind end pins	16x32-in. Landis grinder	15
44	Restraighten center bearing	P-2 Ferracute press	120
45	Grind Nos. 1 and 4 contours	16x32-in. Landis grinder	20
46	Grind Nos. 2 and 3 contours at a time using wide wheels	16x32-in. Landis grinder	37
47	Restraighten center bearing	P-2 Ferracute press	120
48	Inspect	Bench	...
49	Cut recess and oil groove and bead edge of front bearing	14-in.x6-ft. Reed-Prentice lathe, plain rest, oil pan	100
50	Finish straddle flange	14-in.x6-ft. Reed-Prentice	30
51	Finish $1\frac{5}{16}$x$2\frac{1}{4}$-in. counterbore in flange end	No. 0—7-ft. Reed-Prentice lathe, power-cross feed, cam lever	...
52	Finish turn diameter of flange and chamfer	14-in.x6-ft. Reed lathe, plain rest, oil pan	60
53	Countersink four letter W holes in flanges	21-in. Cincinnati 4-spindle, multi-head drill	190
54	Tap four $\frac{7}{16}$-in.—20 holes, in flange	24-in. Cincinnati 4-spindle multi-head drill, electric control switch	65
55	Drill for $\frac{5}{8}$-in.—18 tap hole (for starter ratchet)	21-in. single-spindle Cincinnati drill	55
56	Tap hole $\frac{5}{8}$-in.—18 for starter ratchet (semi-finish)	21-in. single-spindle Cincinnati drill	60
57	Tap $\frac{5}{8}$-in.—18 thread hole for starter ratchet (finish)	21-in. single-spindle Cincinnati drill	60
58	Finish grind diameter of oil slinger	12x36-in. Landis grinder	65
59	Finish grind center bearing	16x36-in. Landis grinder	30
60	Finish straighten on centers	P-3 Ferracute press	85
61	Inspect flange diameter, counterbore, and oil threads	.....	...
62	Finish grind flange, main bearing	16x36-in. Landis grinder	34
63	Finish grind gear fit	16x36-in. Landis grinder	38
64	Finish grind gear fit	16x36-in. Landis grinder	65
65	Finish grind fan pulley bearing	10x24-in. Norton grinder	60
66	Mill keyway in gear fit	No. 2 Pratt & Whitney miller	125
67	Inspect	Bench	...
68	Chamfer pulley bearing break edge of gear fit and burr pin bearings	14-in. x 6-ft. Reed lathe	175
69	File all corners	Schraner burring machine, hand operation	...
70	Polish thrust on flange bearing	23-A, 16x42-in. Landis grinder	150
71	Finish grind outside face of flange	12x36-in. Landis grinder	65
72	Wash	Tank	...
73	Inspect	.....	...
74	Lap all bearings	Schraner lapping machine	...
75	Polish all bearings	Schraner lapping machines	...
76	Inspect	.....	...
77	Final inspection	Gisholt Precision balancing machine	...
77A	Drill for balancing	20-in. single spindle Cincinnati drill	...

Camshaft Operation Sheet

No.	Operation	Machine	No. per Hr.
1	Mill to length	No. 33 Kempsmith mill, belt drive	40
		Niles, Ingersoll or Davis-Thomson drum-type milling machine	300
2	Center both ends	Ford standard centering machine	240
3	Rough straighten	No. 00 Springfield press	85
4	Rough turn center bearing	No. 0, 6-ft. Reed-Prentice lathe, geared feed, cam lever tailstock, hand cross feed, chip pan	93
5	Turn between cams, and rough turn second and fourth bearings	Special No. 0 Reed-Prentice lathe, cam tailstock, back rest	40
6	Straddle face flange, nick front bearing and seven recesses	14-in.x5-ft. Reed-Prentice lathe, back gears, cross-slide, back arm	60
7	Rough turn gear post and flange	Special No. 0 Reed-Prentice lathe, cam tailstock, back rests	75
8	Drill "L" hole in flange	20-in. single-spindle Cincinnati drill	200
9	Rough turn front and rear bearings	14-in.x6-ft. Reed-Prentice lathe without tailstock, back gears or back arm attachment	75
10	Straightening	No. 00 Springfield straightening press	50
11	Rough grind center bearing	No. 22 Landis grinder	100
12	Turn cams	Melling cam turning lathe, hand operated chuck	35
13	Straighten	No. 00 Springfield straightening press	60
14	Cut oil grooves on Nos. 1-2-3 and 4 bearings	14-in.x6-ft. Reed-Prentice lathe, back gear, power feed to cross-slide, plain rest, tailstock	60
15	Undercut center bearing for clearance on teeth	14-in.x7-ft. Reed-Prentice lathe, cam-lever tailstock, back rest, oil pan (temporary)	150
16	Cut teeth	No. 18-H Gould and Eberhardt gear hobbing machine	38

17	Harden	Ford spinning machine	70
18	Polish one cam for sclero-scope	No. 6 Hisey-Wolfe grinding machine	500
19	Restraighten	P-3 Ferracute press	90
20	Finish grind center bearing	6x32-in. Norton grinder	50
21	Finish grind front bearing	10x24-in. Landis grinder, belt drive	50
22	Finish grind rear bearing	10x24-in. Landis grinder	50
23	Face outside of flange	14-in.x6-ft. Reed-Prentice lathe, plain rest, oil pan	76
24	Finish turn gear post and chamfer	14-in.x6-ft. Reed-Prentice lathe, extra heavy	90
25	Drill N holes and ream to 0.3125-in. in flange	4-spindle special Foote-Burt drill	150
26	Inspect	Pratt and Whitney camshaft comparator	190
27	Grind face	6x18-in. Landis grinder	75
28	Thread gear post	Special Illinois threader	250
29	Straighten	No. 00 Springfield straightening press	60
30	Finish grind cams	16x42-in. Landis grinder	12
31	Remove burrs from cams	Special Ford centering machine	250
32	Straighten front bea ..	P-2 Ferracute press	100
33	Straighten center bearing	P-2 Ferracute press	100
34	Finish grind outside face of flange	No. 20 Landis grinder	200
35	Mirror polish cams	No. 4 HFD Hisey-Wolfe buffing machine	100
36	Wash	Blackslee washer	600
37	Polish all bearings	3-wheel Besley polishing machine	...
38	Finish straighten	No. 00 Springfield press	100
39	Final inspection, for size, timing and trueness	Hand operation	...

Substitution of Steel Castings for Cast Iron in Machine Tool Construction—*Discussion*

By J. B. Armitage
Chief Mechanical Engineer, Kearney & Trecker Corporation

MR. HART'S article in Vol. 68, No. 15, page 626, contains much that is interesting but very little that is not known to the average up-to-date machine tool designer.

Cast iron continues to be and undoubtedly will continue to be for some time the dominant metal in machine tool construction. This is due not so much to the fact that machine tool designers and builders are not acquainted with the advantages of steel castings, arc welding and aluminum alloys, but rather to the fact that they realize their shortcomings as well.

Cast iron is apparently an ideal metal for much machine tool construction. It is quite readily cast to the desired shape, it is easily worked, its cost is low as compared with other metals, it is one of the few metals which can be used for the two mating parts of a bearing, and, lastly, sound castings can be readily obtained from any convenient foundry.

While it is true that steel castings made in some of the modern steel foundries equipped with electric furnaces are smooth and sound, this is not true of the product of all steel foundries, as most machine tool designers have found to their sorrow If we could be sure of getting sound steel castings, we should still have the higher cost as compared with cast iron for such parts as beds, or as compared with steel forgings for such parts as gear blanks. It is true that steel castings have a modulus of elasticity greater than that of cast iron but mass seems to have its place in machine tool design for the absorption of vibrations and so we can generally compensate for the lower modulus of elasticity by putting in more cast iron.

It is quite probable that some time in the future we shall have beds made of steel with the ways hardened and ground, but at the present time our equipment for hardening and grinding such parts is far from being satisfactory and as the steel castings cannot be used without being hardened, and when hardened would have to be ground, it is quite clear that for some time we shall have to be satisfied with such parts made from cast iron, which can be readily scraped true to form.

By E. Stubbs
Factory Manager, The Fellows Gear Shaper Company

MR. HART seems to be writing of a far-off day when steel foundrymen will have overcome all the troubles which have long worried them. The writer has seen a number of wonderful steel castings in the past few years, and like all other men in the machine tool business is only too anxious to make use of this material when they can be made at a reasonable price and with a fair degree of uniformity.

To date it seems to be the experience of people in our line of business that pieces of the weight which Mr. Hart seems to suggest can better be made from steel forgings both with regard to price, strength, and uniformity. The steel foundry people must make further progress before the machine tool manufacturer can be criticised in the way that Mr. Hart sees fit to do.

By B. P. Graves
Brown & Sharpe Manufacturing Company

I HAVE read over Mr. Hart's article with considerable interest, because of the fact that we have had a rather sad experience of late in reference to steel castings. We had the very thought in mind expressed by this article, that many of the parts that we are using in machine tools could be made stronger and to better advantage if it were possible to secure steel castings, and we took this matter up with the steel foundry and were promised and assured by them that we could obtain steel castings just as true and sound as we get from gray iron; so we started off immediately with some test cast-

ings which did not prove at all satisfactory, due to their coming full of holes, being dirty and, in some cases, so hard they could not be machined.

We notice in one of the paragraphs, that the writer states that the modern electric steel foundries can furnish castings just as true to form, as smooth and as sound as the best iron castings. If that is so, and we hope it is, it would simplify matters for us and give us a much better finished product. This has been a very great problem with us for a good many years, and it seems to the writer that steel foundries still have a long way to travel before they reach anywhere near perfection.

It might be well to add that the machine tool industry is searching continually for better methods and better material to make the finished product a still better and stronger unit.

Trade Association Statistics: The Legal Aspects

By Benjamin S. Kirsh
Of the New York City Bar

IN THE last five years the judicial attitude of the Supreme Court of the United States has undergone a distinct change toward trade-association activities. No longer is it necessary to press the contention upon the law concerning the substantial social advantages of a sound statistical reporting plan as a periodical, accurate and reliable inventory of business conditions.

In general it may be stated that in the absence of an agreement among competitive business units, or a concerted course of conduct evidencing wrongful purpose either to control prices or limit production, the test of economic soundness has been woven into the fabric of the law as a prime factor in determining the legal validity of statistical reporting practice.

From this point of view, the desirable and legitimate scope of trade-association statistical activity must be analyzed in terms of utility, adequacy and efficiency. Statistics must be concrete, timely, accurate and continuous. They must disclose a complete picture of current business to be of advantage. However, the statistical service, under insistence of the law, must be no more than a guide for each individual member's intelligence and reason.

In considering the reported cases, it is perhaps most useful, in a general survey, to regard them all compositely. However, a knowledge of the most liberal view expressed by the Supreme Court is not amiss. The exact holding in a celebrated case is as follows:

"We decide only that trade associations or combinations of persons or corporations which openly and fairly gather and disseminate information as to the cost of their product, the volume of production, the actual price which the product has brought in past transactions, stocks of merchandise on hand, approximate cost of transportation to points of consumption without reaching or attempting to reach any agreement or any concerted action with respect to prices or production or restraining competition, do not thereby engage in unlawful restraint of commerce."

But in its practical effects, because of the paucity of case law on the subject and also because of the new judicial point of view, the ruling cannot be contracted to such narrow limits.

As noted above, an evaluation of the effect of the aggregate of all the facts of the particular plan under review, taken as a whole, rather than the presence of a certain evidentiary feature, is the proper method of approach. The groupings which follow cannot be deemed absolute or final as measures of right or wrong, nor as an infallible index of the practices permitted.

1. Secrecy in reporting data and the limitation of the information to the members of the association, have been regarded as one of the potent reasons for adjudging a reporting plan illegal. Buyers as well as sellers should be notified of market conditions, with adequate publicity to the buyers. The publication of the statistics available to sellers should be reported to the Department of Commerce, trade journals, or some other neutral reporting medium.

2. Statistics must be disseminated fairly and be a record of actual transactions. A restriction of reported sales only to the "best sales" in an effort to bolster up a declining market or assist in the maintenance of high prices, could scarcely seriously commend itself to favorable judgment by the law.

3. The report must not give more detailed or specific information than is necessary to afford to the other members of the industry an adequate knowledge of fundamental conditions affecting the industry. For this reason the dissemination to the secretary and the membership of copies of invoices of each transaction exceeds the bounds required by adequacy of information.

4. Comments, advice or suggestions by an official or representative of the trade association dealing with the production or price policy of each individual member, seem to be regarded by the courts as a clear indication of group pressure, forcing the members to act in concert and in conformity with a joint plan. Furthermore, the law, because of the strong possibility of formulating joint price policies at meetings, hesitates to permit the mutual discussion of past prices at such times.

5. The decisions draw a vital distinction between reports of the price of "past transactions" on the one hand, and "current" or "future" transactions on the other. While the former having been adjudged permissible in the ordinary case and in the absence of special circumstances the latter appear to be forbidden.

6. There must be no penal provision to compel each member under duress of fine, suspension or expulsion, to conform to group action rather than individual discretion. The member should not be penalized for exercising his own individual judgment as to the limitation of his production or the price of his products, or the territory in which he will sell.

7. A drastic supervisory system which amounts, in substance, to an actual or potential control by the association of the individual's affairs, is another feature which has received judicial condemnation. When such an instrument is employed for the purpose of prying into the affairs of a member, to discover whether he has complied with a joint agreement of the membership, or operates as a constant threat of exposure, its use is forbidden.

With a mutual appreciation by business of the settled policy of the law and by the courts of the difficulties and necessities of modern business, trade association statistical reporting plans should show further development.

Abstracted from the American Bar Association Journal, May.

Summary of research policies of 187 "millionaire" manufacturing companies in the metal working industries—Average expenditure for research is $68,300 per year

RESEARCH in the *Metal Working Industries*

MOST of what has been said concerning research has come from the engineer, the chemist, and the physicist, who are accustomed to look upon the results of their work as a service necessary for the advancement of civilization, which it has been to a large extent. The executive, who is held responsible for the expenditures of his company, must view research only from a dollars and cents angle, since to him is put the question, "What benefit will my company gain from research?" For the purpose of determining what the executive thinks about research in regard to its scope, results obtained by it, and facilities available to it, a survey was instituted by the Division of Engineering and Industrial Research, of the National Research Council. Eight hundred replies were received from inquiries directed to the executives of "millionaire" manufacturing companies. The replies were particularly gratifying, not only because of the number received, but because 50 per cent of the replies were dictated by the presidents of the various companies.

One of the many industrial fields reached by this survey was the metal-working industry, which, in itself, comprises companies manufacturing a wide variety of dissimilar products, each having its own separate problems and with only a few points in common.

Replies were received from 187 companies in this industry, 53 per cent of which indicated that they sponsored some form of research. Seventy-five per cent of the companies sponsoring research maintain their own laboratory organizations. The remaining 25 per cent have no laboratories, but sponsor research through co-operative organizations or make use of university or government facilities. In addition, about half of the companies without laboratories maintain research organizations in their engineering development departments.

The amount expended in research by these companies varies considerably and depends upon the size of the company pocketbook. Some of the larger companies spend as much as $500,000 a year, but on the average expenditure amounts to 2.1 per cent of the capital invested, or about $68,300 a year.

None of the companies indicated any intention of curtailing the amount of expenditures, but on the contrary many indicated that their research budgets were increasing regularly each year. One company, manufacturing bronze bushings, reported an increase over its previous year's expenditure of 50 per cent.

This tendency toward increased research activity is in itself evidence that the executive believes in research and considers it necessary for the continued success of his business. When that condition is reached, where the directing heads of business have complete faith in research, a big step ahead will have been taken.

> The benefits of at least one-third of industrial research are passed on to the consumer in the form of improved products. . . . Development of new fields of application for standard products is of major interest to twenty-five per cent of the metal working companies. . . . .

Research in an industrial organization may be expected to be directed to purposes most likely to earn dividends. Investigation for the purpose of reducing production cost leads to the most obvious and easily estimated money return, but strangely enough, only 30 per cent of the companies placed major emphasis on this phase of research. A slightly greater percentage of companies is more interested in finding methods for improving the quality of the manufactured product, even though the profits resulting from it are difficult to visualize. Thus, the benefits of at least one-third of industrial research are passed on to the consumer in the form of improved products.

In the metal-working industry there are few by-products, and consequently research for new ways of using them is of little importance. The development of new fields of application for standard products is of major interest to 25 per cent of the companies. Competition has forced many concerns to fit their products to the individual requirements of the user. This has necessitated research of a servicing nature, which, though of value to the manufacturers because of the good will it secures, frequently involves work that should logically be performed by the consumer.

Facilities

Facilities for research other than in company organizations are confined mostly to university laboratories and government experiment stations. Of the various co-operative organizations in this field, few have their own laboratories and use such facilities as are available to the industry in general. In some cases co-operative research is carried on in the laboratories of the member companies.

The widely differing products and manufacturing processes in the metal-working industry have resulted in many contradictory opinions regarding the adequacy

of research facilities. According to the president of a company manufacturing textile machinery, "Research facilities available in this industry are absolutely inadequate." On the other hand, the president of a company manufacturing brass products feels that "almost unlimited research facilities are available in our industry, because we can obtain not only good men for our individual research, but also facilities of all of the various institutions. It is our belief that the present facilities in the United States are very good and that research work is of profit." The number of executives who hold the opinion that facilities are inadequate is about equal to the number who consider them adequate. Consequently, no general conclusion in this regard can be drawn. It is probably safe to say that if more facilities were available industry would quickly find uses for them.

In one reply is found the following: "The writer has no idea of the research facilities that our industry affords. We are adding right along to our facilities, and as necessary apparatus is needed it is purchased." Such ignorance can mean only that this company is not keeping abreast with the development in its own industry, and may very likely be spending money for research that has already been done, or for equipment otherwise available.

Profits of Research

In judging whether or not research is profitable, the executive accustomed to considering new developments from an economic viewpoint should investigate the ultimate effect of the laboratory results upon the profit of his business, and then decide whether or not these profits are worth what it costs to obtain them. It is recognized that many of the profits accruing from research are intangible and difficult to estimate. Improvements in quality of product and services to customers earn the good will of the consumer, which results in a profit that is intangible—difficult, if not impossible to estimate. The discovery of new methods, new uses for by-products, and new fields of application, however, leads to profits that are easier to evaluate.

One feature of the survey was that all of the companies maintaining their own laboratories reported that research had returned large profits, though few of them were able to give figures regarding its extent. The ratio of profits to laboratory investment was variously estimated at about 100 per cent.

Only two of the companies that do not support laboratories, but contribute to co-operative research, felt that the profits of research were questionable. The opinion of a majority of the executives of those companies supporting research to only a limited extent is well expressed by the president of a tool company, who says, "We do our own research work to such extent as is possible, and wish that the future might show ways and means of enlarging this program."

The unreserved endorsement of research by executives is evident from their many statements. The executive of a magneto manufacturer finds that research has made it possible for him to lead in this field; and in the field of boiler manufacturing one company replied that "without research, continued manufacture of this product would have been impossible."

Thus, in seeking an answer to the question, "What does the executive think about research?" we find it not merely a profitable investment, but an activity that is frequently absolutely necessary for continued business success.

SEEN · AND · HEARD

By John R. Godfrey

Chemistry aids in brazing—Variable speed devices

I'VE had a hunch for a long time that the chemist was going to help us out in many machine shop problems. And now we have an excellent example in the development of a new brazing process in which the work to be brazed is kept surrounded by hydrogen gas while in the furnace. This method has, I am told, been used in brazing steel golf sticks in a small way, by keeping the steel "sticks" in a sealed tube in the furnace. But hydrogen gas is burnable and explosive when mixed with air, so that the process is not a particularly safe one. In the new plan, the work is heated in an electric furnace in which it is surrounded by hydrogen.

Hydrogen, it seems, has the very desirable property of eating up oxide, or rust, and so makes the steel to be brazed perfectly clean, doing away with the necessity of using any flux. With the surface perfectly clean, the copper heated to the fluid state by the furnace has the uncanny faculty of hunting out all holes and crevices, no matter how minute, and filling them solid. No more "puggling" or coaxing of the spelter to flow where you want it. You can't keep it out if you want to—which you don't.

There's another funny thing about this brazing method, too. You don't even have to put the copper right at the joint. Just place some copper wire, or copper chips, somewhere near the joint—and the heat and the hydrogen do the rest. Whether it's one joint or twenty, doesn't matter, just put enough copper on the work and every joint will be brazed. If there are rivets in the piece that don't quite fill the holes, the copper finds its way in and does the job.

I've been playing the machine game a good many years and have seen many wonderful processes, but I don't recall one that gave me more "kick" than to see this brazing process and examine the work afterward. The chemists call it "hydrogenated," which the shop man will probably dub "hydro" in a short time, to save wear and tear on the lower jaw. But I take off my hat to the chemical, electrical and mechanical engineers who discovered, developed and made it possible. It seems, off hand, as though there were a million little places where this process would improve the product and save money.

* * * *

Variable speed devices have been a will-o-the-wisp for many years. We have all seen them come and go—mostly go. Frictions, gears, and hydraulics in various forms all have their innings, yet the nearest approach to practical use are the hydraulic feeds used on grinding and other machines. Rotary transmissions are still, for the most part, in the gear box stage, with several positive speeds and nothing in between. But inventors do not despair, and the device we are looking for may be just around the corner.

There is a fascination about these devices that lures inventors on in spite of failures, and we are bound to have one handed to use some of these days that works as we have wanted it to do.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Helping the Efficiency Engineer

"DID you see that guy with the big boss this morning, Al? I'm told he's one of these efficiency bugs, and that the old man is going to turn him loose in the shop next month."

"Don't go off half-cocked, Ed. He may not be as bad as you think."

"Didn't know you had a leaning for that sort of a thing. What good will he do you, Al?"

"You're excitable today, Ed. I've known various breeds of efficiency engineers. What I think about most of them isn't fit to print. But there are a few who have a heap of horse sense and who can help any plant a lot. Let's hope he's that kind."

"But what can a young chap like that do for us? We've had a lot more real experience than he has. All I've ever seen these efficiency men do was come snooping around, ask a lot of questions, and get good money for telling the boss the things he could have found out from his own men. Are you going to help him put it over on the old man?"

"If this bird is the kind of man I hope he is, he ought to help us. He's young, to be sure, but he'll get over that soon enough. He has the advantage of being able to study the methods of many plants, while we visit mighty few besides our own. It's up to us to tell how we do a job—and *why*, if we happen to know. If our methods are as good as we think they are, he probably won't want to change them, but the chances are he's seen things outside that we ought to know about."

"You're an optimist today, Al. Of course he'll suggest some changes just to make a showing. Why should the old man pay good money to have some one tell him our shop is O.K.?"

"For the same reason he pays the doctor a ten-spot to examine him and tell him his liver is all right. It's worth more to know you are right than to have to make changes, though I'll admit few managers think they get their money's worth unless a lot of changes are recommended. He'll probably suggest changes and he's likely to be partly right anyhow."

"I don't see why we should help him, Al. If he knows enough to draw down a big fee, why talk to dubs like us."

"Forget that line of talk, Ed. It's our job to help the boss any way we can. And it's only fair to the man who is going to give us the once over. But, if he makes any recommendations that don't seem to belong in this shop, it will be our turn to speak a little piece to Williams, and the old man, too."

Should the foremen help the outsider, or let him find out things for himself? Is Ed right in feeling that the new engineer must recommend changes to make a showing? Is Al justified in hoping the young man can show improvements in methods?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Vacations as a Bonus

IN view of its outstanding merits, no alternative should be offered between vacation and a cash bonus. The time annually allotted to the employees is done for a definite purpose and to add a proviso for a cash bonus in lieu thereof would be in direct opposition to the purpose for which the vacation was inaugurated.

After the return from such a sojourn, the workmen are thoroughly refreshed; likewise, their spirits are sufficiently active to withstand an additional year of strenuous labor. However, if the optional cash plan were in force, this would not be true, and the manufacturer would inevitably suffer a loss through incapacitated labor.

—HARRY OTTERSON.

Helping the Firm Make Sales

ED'S friend should not attempt to carry out a sale because he does not know the price that the company would quote that particular customer, nor the terms it would make. Moreover, the company does not have to back him up in carrying out the provisions of the sale because he is not a recognized agent or salesman of the company.

However, a commission should be paid him as a token of appreciation by the company for his effort, and he should be diplomatically cautioned that in the future when an opportunity arises to make a sale, he should immediately notify the sales department of that fact. A salesman will be in a better position to quote terms, prices, and discounts to the customer. However, a commission should be paid the worker in that event, even though he personally did not complete the sale.

—JOSEPH BELL.

Promoting Interest Among the Boys

STARTING with boys is good; if Al treats his subject right he will soon have the men also taking an interest in his efforts.

Let him start with the class of machine made by his own company, comparing the firm's machine with that produced by competitors, giving the differences and why. This may sound like advertising the other fellow, but if the firm's goods will not stand comparison how can it justify its existence? A knowledge of the other fellow's goods and methods is one of the best incentives to take an interest in your own firm's goods.

It is certain that Al will be surprised at his own lack of knowledge of some machines, and he will prove the truth of the saying that the best way to learn is to try to teach someone else. —A. F. GUYLER, *England.*

THE·NEXT·TOPIC

Paying More to Save Money

ADVANCE QUESTION

The screw-machine man wants to change certain parts from steel to brass so that he can speed up production. Al is enthusiastic, but Ed thinks they shouldn't interfere with designs. Who is right?

He Never Asks for a Raise

THE honest and dilligent worker seldom "blows his own trumpet" or asks for a raise. He has implicit faith that the management will mete out justice, and he has confidence in his own ability to merit it. He thinks that asking for a raise would put him in the same humiliating position as poor little Oliver Twist when he asked for more. Unfortunately, through a lamentable lack of intuition among many managerial staffs, the honest worker does not get his deserts.

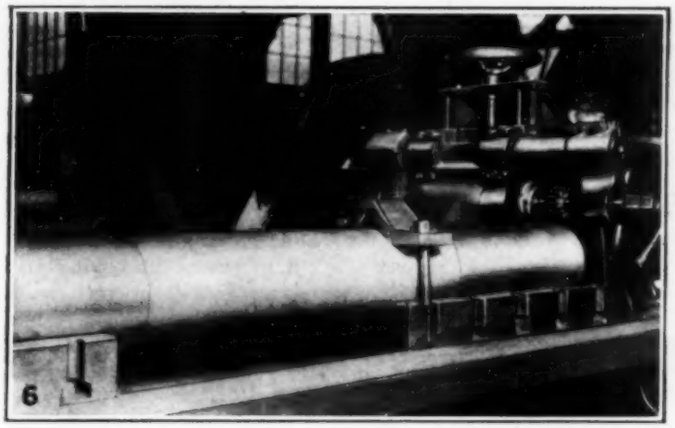
It should be easy for the management to segregate the wheat from the chaff. If they find they have an indifferent workman they soon "fire" him, therefore it is only logical for the management to reward diligence with promotion. Above all, let honesty and plain dealing exist between the worker and his employers, and eschew blood ties and craft associations when determining a man's ability and merit. —W. J. HOPGOOD, *England.*

Should He Report Another's Error?

IT WOULD appear to the outsider that about every one involved in the transaction cited made an error, except possibly the man accused.

In the first place, where was the foreman in whose charge the diverted air tool belonged? There must have been something fundamentally wrong with his methods or principles, if he permitted the loss of so expensive a tool to pass unnoted.

I cannot see any need for discussing the possibility of firing anybody. It is not reasonable to suppose than any operator, even in the event that he could not make a repair himself, would be so ignorant as to think that merely placing an otherwise good tool in the scrap yard would close the incident. He might have set it to one side or turned it in for repair elsewhere, once he found that it was beyond his ability to repair the trouble, but he wouldn't dispose of it as scrap. —D. C. WRIGHT.



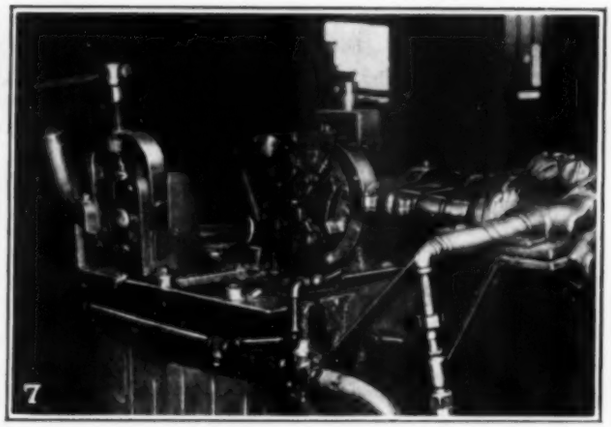


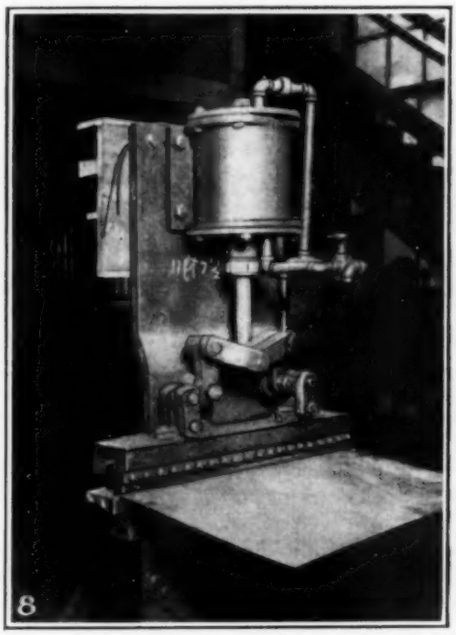
Fig. 6—A portable, air-operated keyseater for driving axles. Fig. 7—A pipe threader driven by an air-motor

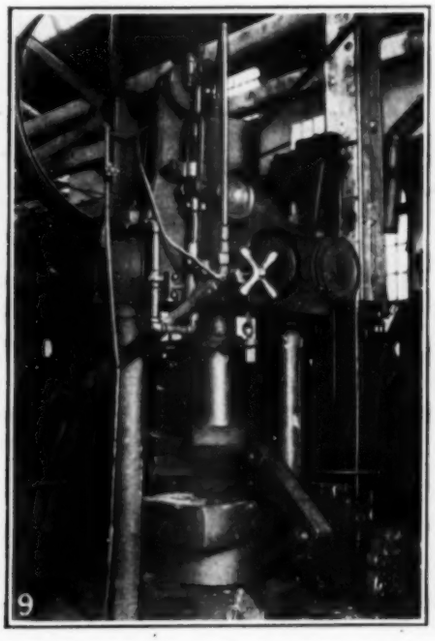
Odd Jobs from a Southern Railway Shop

AMONG some of the home-made devices in use at the Nashville, Tenn., shops of the Nashville, Chattanooga and St. Louis Railway Company, is the machine for milling keyways in driving axles illustrated in Fig. 6. The axle is located by both journals in V-blocks and is held in place by strap clamps. The housing or slide in which the cutter spindle operates is mounted on an upright frame, and can be adjusted vertically by a handwheel, so that the cutter can be set to any desired height. An air-operated motor located at the far side of the machine drives the cutter spindle and also feeds the work table through spur gearing and a rack. The machine is portable, although it is rarely moved from its location in the axle and wheel shop.

To reduce some of the manual labor required in threading pipe, a standard hand-type pipe threader has been equipped with an air drive as shown in Fig. 7. Spur

Conclusion of the article.





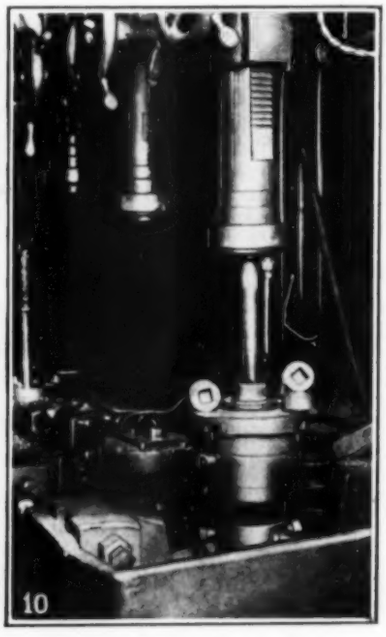


Fig. 8—A home-made punch for piercing jackets. It is operated by a 10-in., double-acting air cylinder, through toggle joints, so that a 2 to 1 leverage is obtained. Fig. 9—A hydraulic press used chiefly for pressing bushings into connecting rods, but shown taking the "spring" out of a link. Fig. 10—Threading connecting-rod grease plugs in a staybolt machine, to which is attached a self-opening diehead. The work is driven by a shank held in the spindle of the machine, and machined square at the driving end to correspond with the hole in the work

and bevel gears are used in transmitting the power from the motor to the diehead. The motor is supported by wrought-iron brackets attached to the pipe bench. After a section of pipe to be threaded has been located and secured in place by the pipe vise shown at the left, it is merely necessary for the operator to open a valve at the side of the bench to put the machine in motion.

An air-operated punch for piercing rivet holes in jackets is illustrated in Fig. 8. The ram of an 8-in. air cylinder is connected to a double toggle joint, arranged so that the punch holder descends when the ram is raised. This construction is used instead of a direct connection, in order to gain a two to one leverage, and thus increase the power. The jackets are inserted over a die plate and located endwise against a stop pin, after which the air is turned on causing the punch to pierce sixteen holes in the work. A double-acting air cylinder is used.

A hydraulic press, operated by a single-action pump is illustrated in Fig. 9. Although the machine is used principally for pressing bushings into connecting rods and for similar operations, it is shown set up to take the spring out of a link. The ram is 6 in. in diameter, and the capacity of the press is 60 tons. A 3-hp. motor is used to drive the pump.

Connecting-rod grease plugs are threaded from the rough casting without turning by being driven through a die attached to a staybolt machine. The scale on the castings is ground off before the threads are cut, however, in order to avoid undue wear on the chasers of the diehead. The work is placed in a guide plate attached to the top of the diehead, and is driven by a shank fitted to the machine spindle as illustrated in Fig. 10. The end of the shank is machined to correspond with the square opening of the plug. Approximately 70 pieces per hr. is the output attained.

Recent Cases in Engineering and Patent Law

REVIEWED BY HERBERT BRAASCH
Attorney-at-Law

THE following paragraphs contain the substance of some court rulings on cases in mechanical engineering and patent law. Cases are taken only from the higher federal courts and from the state supreme courts. Legal terminology has been reduced to a minimum. Each case is designed to cover briefly all the points essential to an understanding of the factors involved. Other "recent cases in mechanical engineering and patent law" will be published from time to time.

Unmolested Patent Infringement May Bar Remedy

The Meyer Manufacturing Company made and marketed a bottle-washing machine, covered by patents. It also was the owner of patents dating from 1907 on another type of machine of which it made no use. In 1915, the Miller company began the manufacture of bottle-washing machines, and was recently sued on an infringement of the 1907 patent by the Meyer company. The court refused to award damages for infringement, and also denied an injunction stopping manufacture of the Miller machine. Its reason was that the delay, when it worked to disadvantage to the Miller company, who had built up a substantial business, since 1915 enlarging and increasing its plant, deprived the Meyers company of a right to damages for patent infringement.

The Meyer company, in the fifteen years that elapsed, never attempted to assert its rights, having full knowledge of what the Miller company was doing. It took Miller machines in trade, rebuilt and sold them, and was familiar with everything that was a violation of the patent. It let the Miller company's business grow up. It also withdrew a suit on another minor patent infringement, which justified the Miller company in assuming its position was secure when it increased its capital and enlarged its plant. Such circumstances operate as a complete extinguishment of the Meyer company's rights. —*George J. Meyer Manufacturing Co., vs. Miller Manufacturing Co., Circuit Court of Appeals, 7th District.*

"Manufacturing Machinery" Construed in Tax Exemption

David J. Joseph operated a scrap yard in which scrap was cut with electric torches to a size that could be handled at the shears and then passed through motor-driven shearing machines, which change the form and dimensions of the metals by cutting them into small pieces of relatively uniform size and shape known as commercial scrap. The machinery and equipment were held to be manufacturing machinery, and as such, were exempt from local tax by a Kentucky statute.—*David J. Joseph Company vs. City of Ashland, Ky.*

Appliances Manufactured to Comply with Specifications Need Not Be Fit for Use

A contract was made for the manufacture of 100 oil burners, as per blueprints and specifications of the buyer, for $28,000. Jigs and fixtures were also to be furnished. The burners were manufactured according to the prints, but as the oil burners were considered worthless, the buyer claimed compensation.

The court ruled that there was an implied warranty of a seller that goods sold would be reasonably fitted for the purpose for which they were ordered, but that applied only to the sale of goods, not to goods specially manufactured to order.—*Metropolitan Lumber Co. vs. Ivers Lee Co., New Jersey.*

Trade Barriers Cause Loss to Consumer

ARTIFICIAL trade barriers, especially of the political type, are the wrong method of controlling foreign trade, stated Dr. Julius Klein, Director of the U. S. Bureau of Foreign and Domestic Commerce, in a recent address.

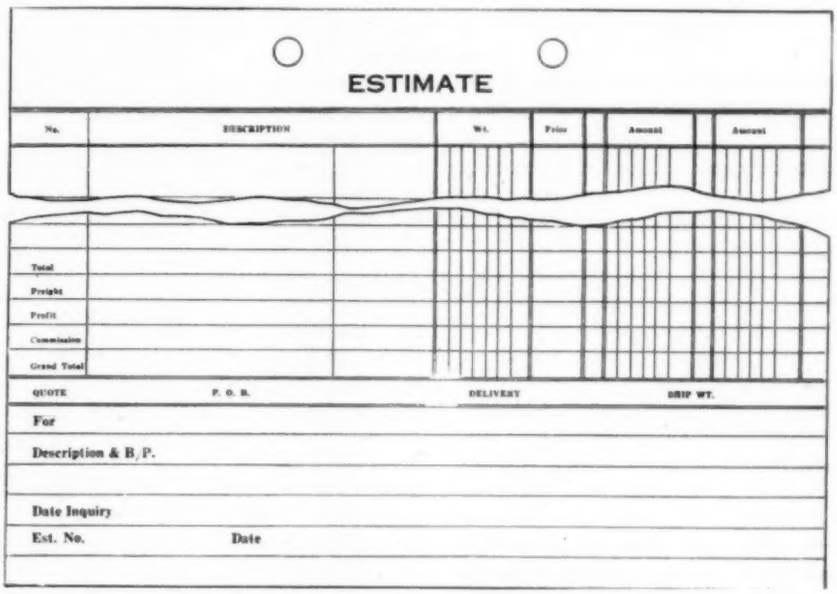
The automotive import quota system as now applied in Austria, Czechoslovakia, Poland, and Portugal is an outstanding trade barrier of this type. The American car, because of its high standing and quality, relatively low cost, and the rigorous and highly diversified conditions to which it has become accustomed in this country, meets very few natural restrictions in entering foreign markets. In recent months, however, a number of artificial barriers have been encountered.

A careful analysis of the Czechoslovakian markets, for example, reveals an actual annual demand for from 5,000 to 6,000 American cars—a demand which cannot be met by local industry, and yet the official dictum fixes an 800-car limit to our shipments. The practice is made even more irritating by the fact that the same quota is fixed for any European country, no matter how small its local production of cars. The final result is, of course, a loss to the foreign consumer who is thus deprived of the advantages of American mass production.

A System for Handling Heavy Contract Work

By George S. Brady
Associate Editor, American Machinist

HEAVY contract work that requires a large outlay for materials and considerable labor expense must be completely analyzed from the standpoint of all engineering problems involved before a competitive bid is entered for the work. At the plant of the Birmingham Machine & Foundry Company, which specializes on large contract work, this analysis is made by the shop executives and foremen, and a complete outline of the work is made up before the estimate is given. In this way the materials used and the actual time necessary to do the work can be accurately estimated, and also the limiting factors, such as availability of machines, can be judged, so that completion dates can be promised with more surety. When a job comes into the plant for a bid, the shop manager distributes copies of the blueprints and specifications to the shop foremen, foundry, pattern shop, and any others involved. It is then the duty of each foreman to lay out the operations in detail, using the form shown in Fig. 1. The machine on which each operation will be done is noted by the foreman at the head of the column, and the time in hours for the machine operation is estimated and filled in. These estimates must be carefully made, as they will form the shop time for the operation if the contract is received. Results of time studies on similar operations are sometimes used as a basis for the estimates, but, due to the wide variety of work, the experience of the foreman and his assistants is generally found to be a more practical way of arriv-


ESTIMATE

No.	DESCRIPTION	Wt.	Price	Amount	Amount
Total					
Freight					
Profit					
Commission					
Grand Total					

QUOTE F. O. B. DELIVERY SHIP WT.

For

Description & B. P.

Date Inquiry

Est. No. Date

Fig. 2—Blank used for the summary of departmental estimates

Birmingham Machine & Foundry Co.
MACHINE SHOP ESTIMATE

Est. No. 28-152

For U.S. Engineer Office Date March 3, 1928

Description 1 C.S. Starboard Sand Pump B. P. or Reference 94

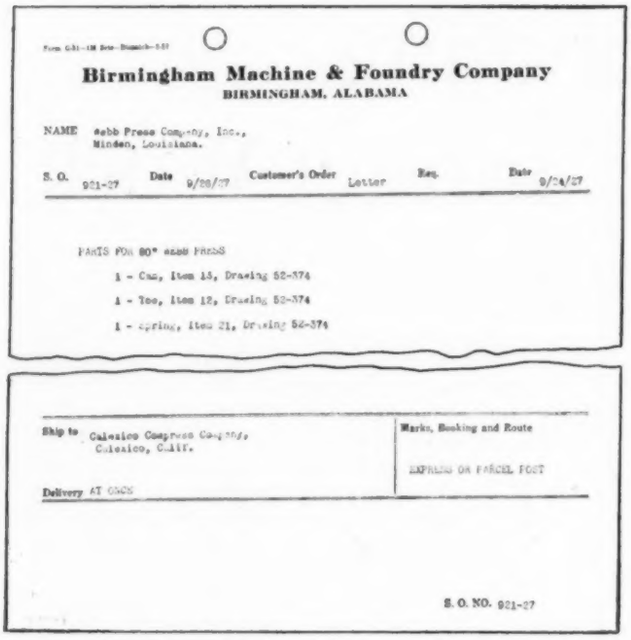
No. Pcs.	ITEM	B. P. or Part No.	B. B2	A B1	A P2	H L0	F R04	F H01	Machine—Hrs S1.	B. L6	B. S2		UNIT Min.	UNIT Time	UNIT Mch.	Class Men	Total Time
												H	J	J			
1	C.S. Top 1/2 Casing	41973		11.	8.75	3.	7.5	5.		1.5				17.			
1	" Bot " "	41974															
1	C.S. Front Cover	41975		24.		4.	6.5							10.			
2	Comp. 1/2 Gland	41989				.5	.5			2.	1.						

NOTE—IMPORTANT: BEFORE Re-Capping Total Hours For Any One Dept. On Any Estimate Be Sure That You Have Checked Up and Multiplied The No. Of Hours Shown For ONE Of Each Of Pieces Estimated On, By The TOTAL NUMBER REQ'D Of Each Piece.

TOTAL

Make Out in Triplicate Estimated by JMB Checked by JMB Skulls Approved

Fig. 1—Estimate sheet for foremen's original estimate



Birmingham Machine & Foundry Company
BIRMINGHAM, ALABAMA

NAME Webb Press Company, Inc.,
Minden, Louisiana.

S. O. 921-27 Date 9/26/27 Customer's Order Letter Req. Date 9/24/27

PARTS FOR 80" Webb Press

1 - Cam, Item 15, Drawing 52-374

1 - Toe, Item 12, Drawing 52-374

1 - Spring, Item 21, Drawing 52-374

Ship to Calexico Compress Company,
Calexico, Calif.

Marks, Booking and Route

EXPRESS OR PARCEL POST

Delivery AT ONCE

S. O. NO. 921-27

Fig. 3—Shop order issued after receipt of the order

ing at the time. A shop estimator, who is thoroughly experienced in all of the classes of work handled by the company, aids in this work and is always at the call of the foremen.

When the estimates are ready, the shop manager calls a conference of the foremen and the estimator, and goes over the complete job in detail, calling for a "show down" on any operation that seems to have too much or too little time allowed. At the same time, the iron used in the foundry, and the steel and other materials to be used in the shop on the job are estimated and entered. When the foreman made the original estimate and assigned the operation to a machine, he also designated at the top of the column the grade of mechanic that would be used on the job. The men are graded by letters from A to K, each grade having a different hourly rate varying from 28 to 80 cents base wage per hour. After the shop conference, therefore, the labor cost of doing all of the operations can be computed. A complete shop estimate of the job is then made up on the form shown in Fig. 2, giving the weight of material to be used and the labor cost.

This estimate form is then sent to the executive office, where an engineer estimator in the office of the general manager calculates the cost of the material at its current purchase price, and also obtains estimates on the cost of any large forgings or other materials that must be purchased outside on sub-contract. He also supervises the preparation of any other estimates required, such as for packing, shipping, or freight. On any general jobs the overhead is based on a percentage added to the labor cost, and a percentage added to the cost of material to cover overhead and handling charges. The overhead percentage on labor charges varies from time to time, and can be readjusted each month if necessary. Any special job that would tie up one expensive machine for a long period of time has added to it an extra charge for the machine.

Once a contract has been received, based on a shop estimate, a shop order is made out on the form shown in Fig. 3. The estimate file in the shop manager's office then forms the basis of all work to be done on the job, and time cards are issued for the operations as outlined in the estimate with the standard unit time. A piecework or bonus system is not used, but the machine hands know that it is up to them to make good on the time, and it is found in practice that they take a lively interest in making a profit on the contracts. Individual reward for good work is given through advances in grades rather than in attempts at bonuses for individual jobs, as it has been found that the maintenance of a piece-rate or bonus system adds considerably to the cost of getting out the contract. The job card used by the workmen is shown in Fig. 4. The daily record of the man, or men, working on the job is kept on the reverse side. When the operation is completed, a record is made in the last column of the card of the percentage efficiency of the man, based on the actual working time as compared with the standard unit time. A low efficiency on an occasional job is not counted against the man, as the error may be in the estimate, but a continuous low efficiency is considered a cause for investigation. On the other hand, a continued high efficiency is generally considered as the record of a high-grade man.

A schedule of work is made up each day for each foreman. One of the schedules is shown in Fig. 5. The

CARD ISSUED DATE 2-23 TIME 4 0 | CARD RETURNED DATE 2-28 TIME 10 55 | S. O. No. OR ACCT. No. 1006 | MACH. No. 187 | CARD No.

No. PIECES	PATT. No.	B. P. No.	DESCRIPTION OPERATION	STD. UNIT TIME	Class	STD. TOTAL TIME	ACTUAL UNIT TIME	Class	ACTUAL TOTAL TIME	% PROD.
1	52-338		Combination							○
			Set up 2 Housings							
			on Combination &	6.0	a	6.0	6 35	B	6 35	
			Bolt up & put	6.0	g	6.0	6 35	g	6 35	91%
			in 5" Thimble &							
			Rops Press	321						
										○

FIN. ✓ UN-FIN

DATE 2/28/28 CHECKED BY GEN. FOREMAN OR SUPERINTENDENT SIGNED BY

Fig. 4—Workman's job card containing standard time

work of making up this schedule is handled by one man in the shop manager's office, who is a combined estimator and follow-up man, and spends his time in close contact with the foremen and with the jobs in process. The schedule gives a short outline of the jobs in process on the floor, and thus keep a plan of the work always in front of the foreman. A schedule of this kind for follow up was found to be necessary where practically every job entering the shop is different but must be co-ordinated with other parts being made in other departments, and not sidetracked. It is found that one practical man can readily handle the scheduling for about 100 mechanics, and that he becomes so intimate with the work that he is a valuable aid in the estimating for a new contract. In addition, there is a dispatcher in each department who takes care of the stamping of the time cards and keeps the general records for the foreman. There is a daily machine schedule card provided for each machine, so that the foreman can tell at all times what work is ahead of a given machine. All time cards for the day, and also a record of spoiled or corrected work, are sent to the production clerk in the shop managers office each night, and before 2 p.m. the following day each foreman is given a complete comparative report of the workings of each department, together with the completed operation card showing the efficiency of each man on the operations. After the completion of the contract, the complete record of the estimate and actual working time is filed in a folder, and a cross index is made so that if a repeat order comes in at any time, a new estimate can be given at once. A recapitulation of the whole order is also made, as shown in Fig. 6. This shows all concerned whether or not the contract resulted in a profit, and who was to blame for the loss, if any occurred. When a repeat order is received, the price is readjusted, either up or down, depending upon whether the first contract resulted in a loss, or in more than the usual profit. If tools had to be built and figured in the first contract, the customer is allowed a deduction equal to the cost of these on the second order. None of the records of the contract are kept secret from the foremen, with the result that everyone in the plant takes an active interest in each contract in a much more lively way than is usually possible in plants with straight production work.

Birmingham Machine & Foundry Company
DAILY SCHEDULE OF WORK

Dept._____ Date_____

S. O. No.	B. P. No.	Item No.	Job No.	Order No.	DESCRIPTION OF WORK TO BE DONE
					JARRETT---B-1
1006	52-351				1 60" Cylinder-Face & bore to B.P. (321)
					CARMACK---B-2
1006	52-353				2 60" Piston heads- (321) Finish, turn, face & bore to fit cyl. & piston rod to BP
1006	52-374				3 Exhaust throttle valves (321,2&3) Face top surface, bore & face 2 valve seats to BP & temp.
1006	52-374				3 Steam throttle valves (321,2&3) Face top surface, bore & face 2 valve seats to BP & temp.
1006	52-374				3 Steam. Throttle valves (321,2&3) bore bot. bot. face for valve & stem as per BP & Ga.
1006	52-374				3 Exhaust throttle valves (321,2&3) Bore bot. face for valve & stem gland to B.P.
					C ------B-3
1208	52-383A				1 21" bot. cyl. head (att.121) Face, make cyl. fit bore & cut radius to BP & ga.
1227	52-383A				2 21" top cyl. heads - Face, make cyl. fit - bore & cut radius to BP & ga.
1227	52-383A				2 21" bot. cyl. heads - Bore & face for gland to B.P
1006	52-374				3 Steam throttle valves (321,2&3) Face bottom inlet & outlet (3 faces) of valve to BP
1006	52-374				3 Exhaust valves-Face bottom inlet & outlet (3faces) to BP
					XXXXXXX----HB-1 NO JOB
					GLAZENER---HB-2
1006	52-294				1 Lower platen (323-Bore two platen pin holes to LO&BP
1006	52-338				1 Combination (321) Bore sq. shaft bearings & socket arm bearings to LO&BP
					----HB-3
209	S1798				5 Roll shells- Rough bore to BP
					THOMAS---P-2
205	C24803				34 Stands (RL H.) Set up 4 at a time & plane base to BP
205	"				SAME- Plane cap fits to BP
205	"				SAME- Plane lugs to BP
205	"				34 Stands with caps bolted-LO, plane ends to BP

Date_____ Signed_____ FOREMAN

Fig. 5—Sample sheet of the foreman's daily work schedule

Re-Cap of S. O. 1213-27, 2 Pattern Plates

	Est.	Acct. Depr.	Loss	Gain	Cards Show
Foundry.....	$112.60	$106.55	.....	$6.05	$104.45
Machine Shop..	48.30	57.67	$9.37	.....	59.92
Totals.....	$160.90	$164.22	$3.32	.....	$164.37

The customer furnished the patterns for this job.

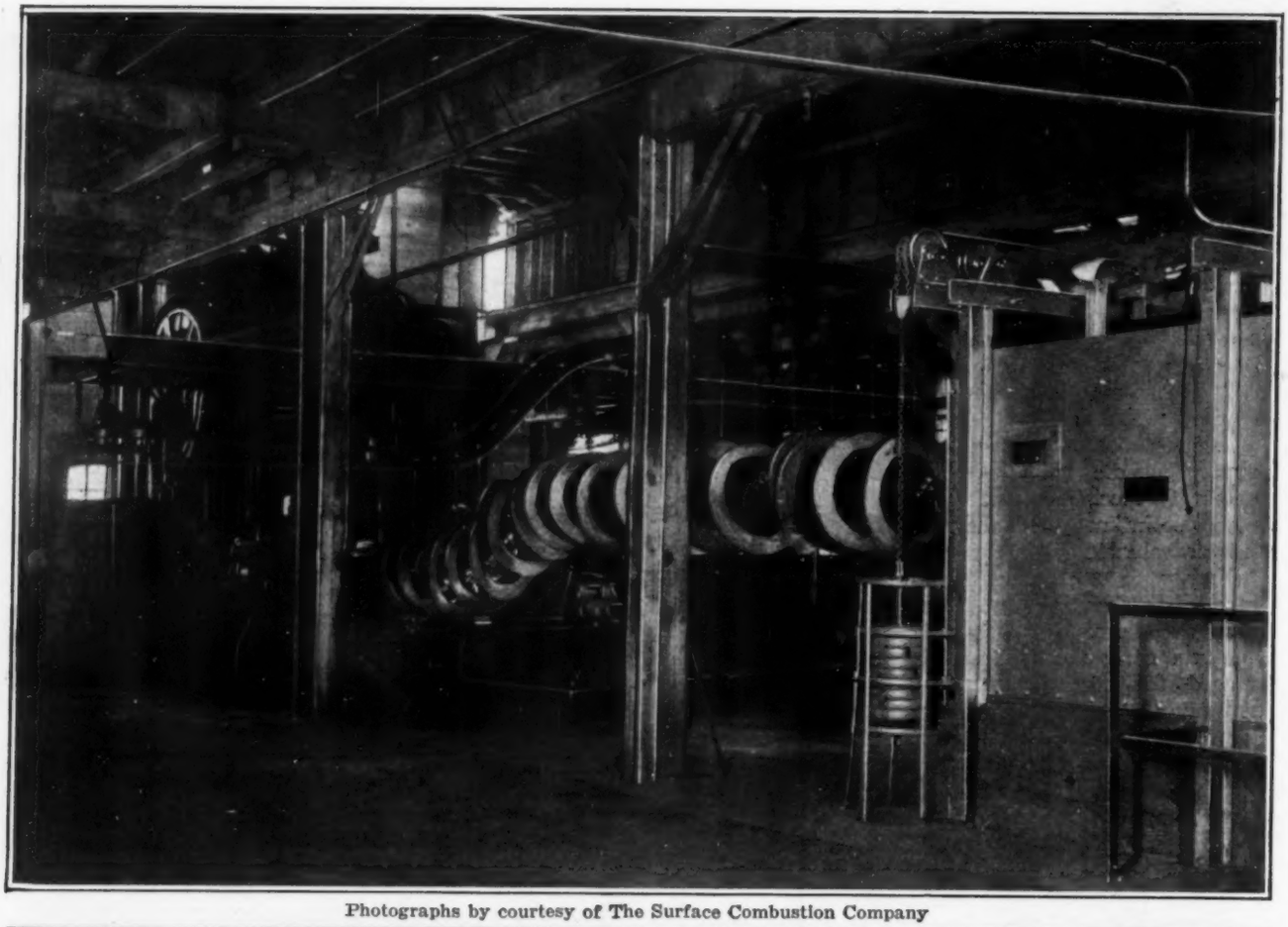
Fig. 6—Sample of recapitulation of a shop order

Vacations With Pay

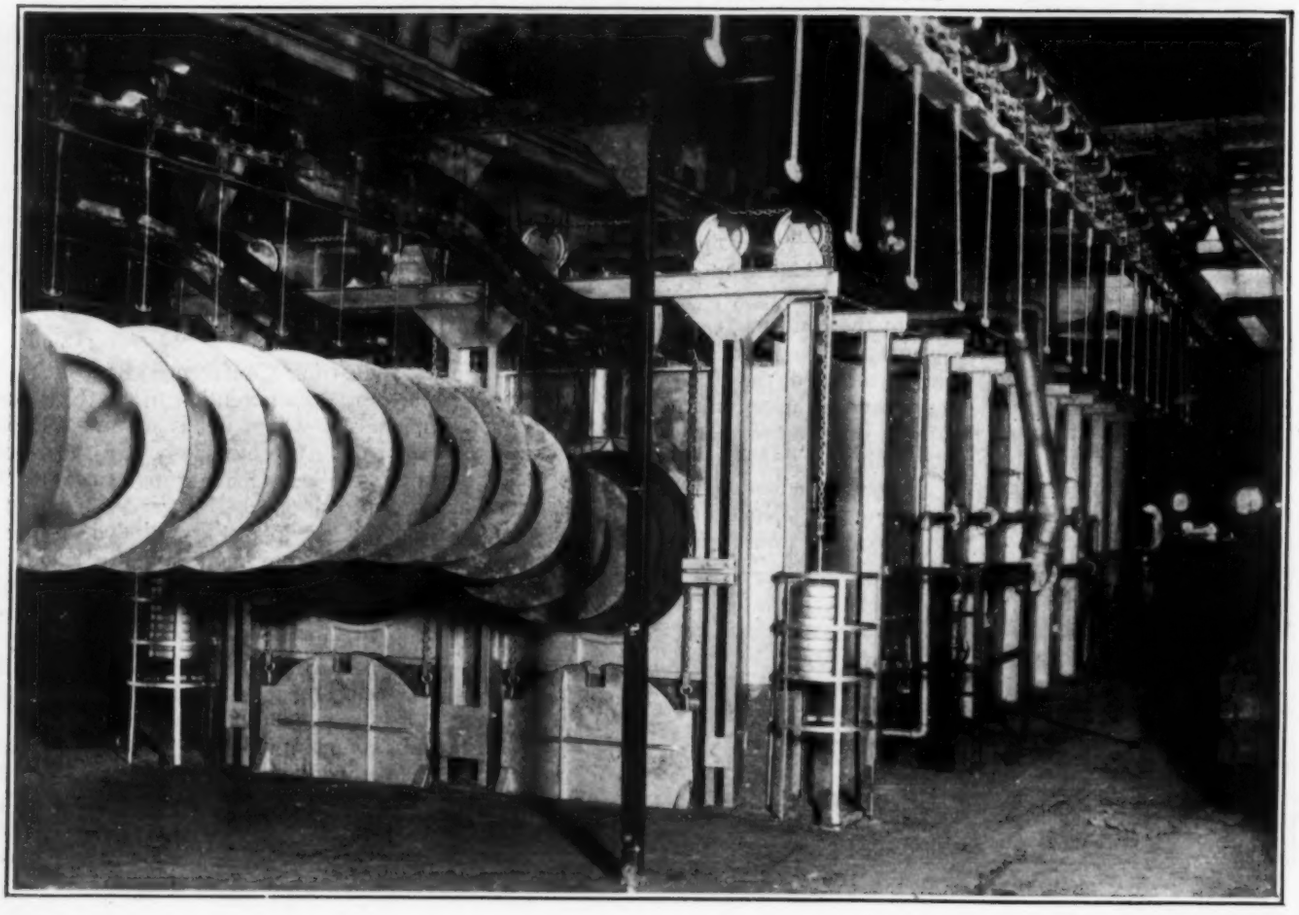
THE National Industrial Conference Board, in a recent service letter, drew attention to the fact that out of 4,655 companies of whom it has inquired, 1,058 give vacations with pay. Approximately two-thirds of these vacation plans have been inaugurated since 1919.

The plans are grouped as graded, ungraded, or shut-down. 56 per cent of the plans are graded, 39 per cent ungraded and 5 per cent shut-down. Including both graded and ungraded plans, 52 per cent of the companies granted a week's vacation with pay for service of one year or less, although some of the companies required ten years of service before any vacation with pay is granted. 63 per cent of the companies with pay vacation plans paid in advance of the vacation.

Those companies commenting on the plan were all favorable to it. The indications seemed to be that it affects a substantial reduction in turnover. In the preparation of any plan for a paid vacation, it is necessary to make certain that the employee takes the vacation and does not go elsewhere for temporary work.



Photographs by courtesy of The Surface Combustion Company



An Annealing Furnace Built into the Conveyor Line

FACED with the problem of annealing steel and copper washing machine tubs between draws, the Mullins Manufacturing Corporation, Salem, Ohio, installed the continuous, gas-fired furnace illustrated. It replaces three drag-chain furnaces that were manually controlled and loaded, and therefore constituted a serious interruption in the production line which was elsewhere mechanically operated. With the old furnaces there was also considerable trouble with scale, caused by the difficulty of maintaining a reducing atmosphere with the manual control.

The new furnace is based on the counterflow principle. In the illustrations on the opposite page the row of copper tubs is entering the furnace to be annealed after the second draw. The row at the right is coming out after having been annealed following the third draw, and is ready for the fourth draw. Heat is given up by the hot work coming out and absorbed by the cool work entering at the same end through the other door. The result is an appreciable saving in fuel.

An obvious advantage is the elimination of hand loading and unloading, the new furnaces being essentially a part of the production line. The conveyor that carries the tubs through the furnace loops around a press at each end of the installation, and in these presses the drawing operations are performed. One of them can be seen dimly at the left in the illustration below. Annealed, partly finished tubs are taken off the hooks on the loading side of each press, and reloaded on the discharge side after the draw has been made, and are then ready for annealing.

Most of the tubs are given five draws, with anneals between draws and pickling as often as scale removal demands. One of the savings credited to the new furnace is a reduction in the numbers of picklings needed. To accomplish this cycle, dies for the first two draws are set up in the presses at each end of the furnace and operations proceed as already explained. The parts are stacked after the second anneal until the dies have been changed for the subsequent draws.

Performance Data

OPERATION—Continuous annealing of copper and steel tubs, and steel baskets, on counterflow principle

HEAT CYCLE—Work enters at opposite ends of furnace at room temperature and is heated to 1,200 deg.-1,300 deg. F. (copper) or 1,600 deg.-1,700 deg. F. (steel), depending on the stage it has reached in the drawing process. It is discharged at 800 deg.-900 deg. F.

FUEL—Natural gas (960 B.t.u.)

FUEL CONSUMPTION—Copper: 54 cu.ft. of gas per 100 lb. Steel: 113 cu.ft. of gas per 100 lb.

FUEL SAVINGS—Guaranteed fuel consumption was lower than that on former furnaces. Actual consumption is 20 per cent less than guaranty

PRODUCTION—Copper: 3,750 lb. per hr. Steel: 4,600 lb. per hr. This is 15 per cent greater than guaranteed production

SPOILAGE—Waste due to improper annealing cut in half. Scale losses are almost eliminated.

A Year of International Economic Achievement

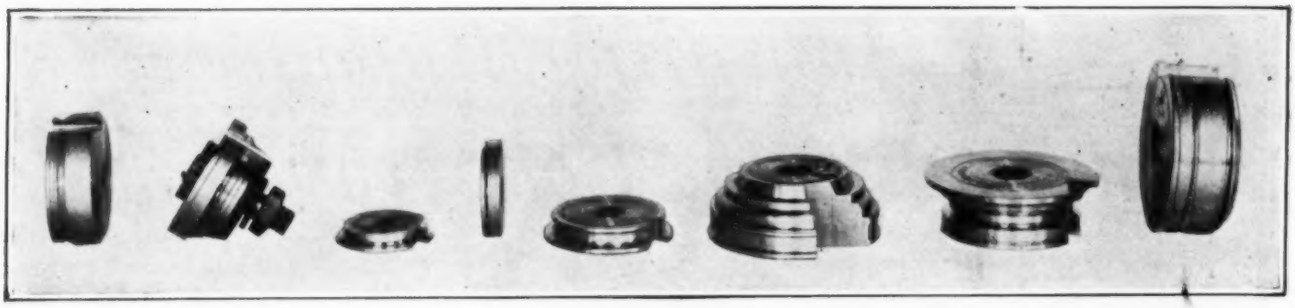
DURING the month of May, 1927, the representatives of fifty nations met in Geneva, Switzerland, in the first International Economic Conference. A twelve-month period has passed and the world is asking what has been accomplished of a practical nature during this period.

At the beginning of June, 1927, a few weeks after the close of the conference, the Council of the League of Nations unanimously approved the report of the conference and expressed the opinion that the latter had fully carried out its task of setting forth the principles and recommendations best fitted to contribute to an economic situation of the world. The council likewise commended the report to the favorable consideration of all governments. Later the Council of the League of Nations set up a consultative committee to follow the application of the recommendations of the Economic Conference.

The governments of twenty-nine states, twenty of which are in Europe, have officially expressed their attitude towards the conclusions of the Economic Conference. All of these governments, without exception, recognize that the principles advocated are calculated to relieve the world economic situation. Most of the governments state that they either hope or intend to apply these principles in their own autonomous policy as well as in their relations with other countries. All of these governments, without exception, announce their willingness to co-operate cordially in any collective and concerted action undertaken under the auspices of the league for the purpose of applying these recommendations.

The recommendations of the Economic Conference have been especially influential in relation to tariffs and treaties, the Treaty of Commerce concluded between France and Germany on August 17, 1927, being outstanding.

During the last twelve months, a considerable number of commercial agreements providing for reductions in a number of tariffs have been contracted, and a number of powerfully supported demands for increased tariffs made during the year have been rejected. In a number of countries the opposing tendencies towards higher or lower tariffs appear to be equally matched. The present period is, therefore, a crucial one.



The Form Grinding of Circular Form-Tools

By Ellsworth Sheldon

Locating angular surfaces with relation to other parts of the contour—Intersections established with precision—Positioning centers of radius outside the form

BECAUSE of the practical impossibility of measuring a diameter over an angular surface, as well as of locating accurately the point at which it meets or blends with another surface in a different plane, the precise disposition of such angles presents one of the most difficult problems to be found in connection with the operation of grinding form-tool contours. In Fig. 16, which is here reproduced in order to avoid the necessity for frequent reference to it in the preceding article, three such angular surfaces—*E*, *L* and *X*—remain to be ground.

Of these, the surface *X* is the most difficult to locate accurately, partly for the reason that it cannot be combined on the grinding wheel with an adjacent, easily measurable surface, the location of which would also locate surface *X* automatically. Of course, the diameter at the small end can be measured approximately and at the large end accurately with a hand micrometer, but neither measurement would be of much assistance in locating the taper lengthwise of the tool. Nor can approximations be considered in these examples, the intent of which is to teach a system of producing contours to a degree of precision that nothing short of a projectoscope can prove in error.

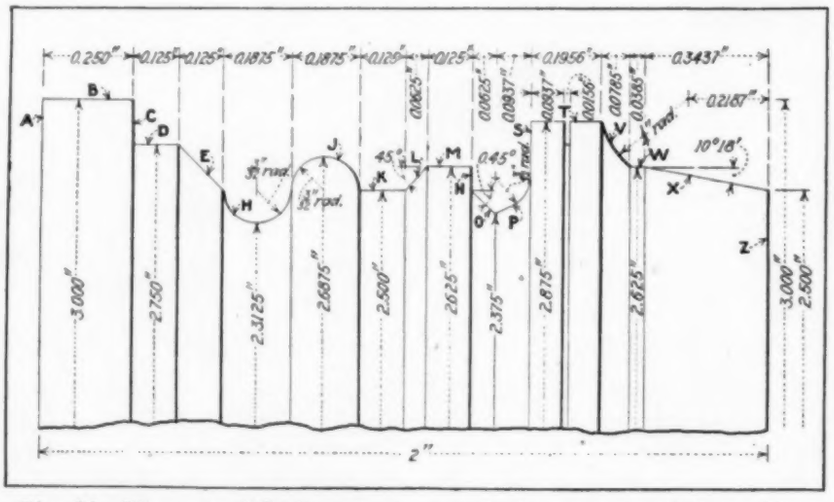


Fig. 16—The most difficult part of contour grinding for the learner to grasp is the method of locating curves, angles, fillets, etc., on the tool in their proper relation. How they are located on the contour by means of the measuring features of the machine is explained in the text

To grind surface *X*, a 60-L disk wheel $\frac{3}{8}$ in. thick is placed on the end of the spindle to the right, and the left side and periphery are dressed true. It is of as much importance, in preparing a wheel to grind an angle on a tool, to set the wheelhead accurately at zero for the preliminary dressing as it is to make the angular setting correctly, else the angle produced on the tool will not be the same as that indicated by the protractor on the base of the wheelhead. To produce the angle of 10 deg. 18 min. on the wheel as shown at the left in Fig. 23 the wheelhead must be turned in counterclockwise direction to its setting. Ordinarily in that case the wheel would be placed on the left end of the spindle in order to avoid interference between the unused end and the parts on the moving table, but in the present instance, the angle is so

The fifth of six articles. The sixth will appear in an early issue.

small that interference is unlikely, and by keeping the wheel to the right, one wheel change is saved.

With the wheelhead set to the given angle, the diamond in the stationary holder is touched to the left corner of the wheel and the reading of the micrometer dial is noted at the instant of contact. The infeed of the wheel is continued, while traversing the diamond, until the overlap indicated by the dial is equal to the sine of the angle to the given radius.

Disregarding the last three places to the right of the decimal as beyond measurability outside of a laboratory, the overlap should be one turn and $22\frac{8}{10}$ divisions on the micrometer dial (remembering that the dial reads double for distances traveled). The wheel will be formed as shown at the right in Fig. 23, the dotted lines indicating the material removed. There is a very narrow band of the original periphery remaining at the right-hand corner, which is very necessary to the next operation of locating the wheel with respect to the work.

Resetting the wheelhead to zero and putting the work on centers, the narrow band of the wheel's periphery is touched to some convenient diameter of the tool to establish a point of departure from which to determine the diameter at the small end of the taper, the reading of the micrometer dial being noted at the instant of contact. Similarly, the left side of the wheel is touched to an already ground shoulder—as the end at *Z*, Fig. 16—and the vernier of the longitudinal scale is adjusted to provide a point from which to measure table traverse. Having positioned the wheel lengthwise of the tool by means of the scale and vernier, the taper is ground by feeding the wheel straight in to the predetermined mark on the micrometer dial.

This taper can be ground—and probably in most cases would be ground—by setting the swivel table to the given angle and traversing the work before any convenient straight-faced wheel as in ordinary cylindrical grinding, relying upon measurements over the small end with a hand micrometer to locate it.

The wheel used in the above operation is also used to grind surfaces *E* and *L* without removing it from the spindle and with a small amount of preparation. For the preliminary work the wheelhead remains in zero position while the periphery is re-dressed straight, as in Fig. 24, and the left side is tested with the diamond to make sure that it still runs true. Next, the wheelhead is turned clockwise to 45 deg. and the diamond is touched to the left-hand corner.

In previous examples, we have referred always to the longitudinal scale and vernier as the means of measuring table traverse, which is equivalent to widths, or distances lengthwise, on the tool to be ground. There is another means quite as accurate and much more convenient by which these movements may be measured when their range is within the capacity of a good dial indicator. This was illustrated in Fig. 4 (first article). Its application will be demonstrated in the following operation.

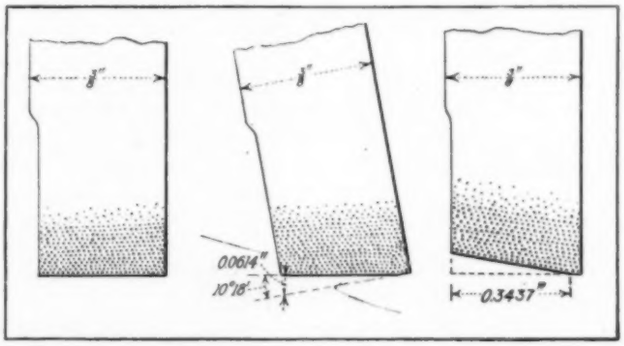


Fig. 23—Dressing a wheel to form a given angle. With the wheelhead set to the angle, the corner of the wheel is "touched" to the diamond and the forward feed is continued over a distance equal to the cosine of the angle

Thus, when the diamond touches the corner of the wheel as above noted, the indicator is brought into action and its dial is adjusted to bring the zero under the pointer. Using both cross and traverse movements in conjunction—quite easy to do after a little practice—the notch to be seen in the periphery of the wheel in Fig. 25 is made; being very careful that the movement of the table to the right does not exceed the cosine of 45 deg. to a radius of $\frac{1}{4}$ in. as indicated by the pointer on the dial. The movement in this case is 0.1767 in. (cos 45 deg. $\times$ r = 0.70711 $\times$ 0.25 in. = 0.1767 in.) and when the dial shows this reading the side of the notch is dressed

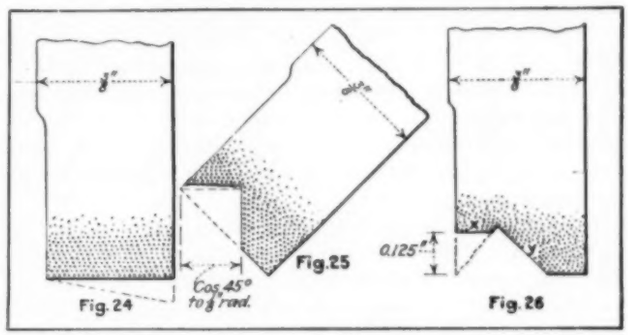


Fig. 24—The same wheel is used for the next operation. Fig. 25—Angular surface located on wheel by calculation and measurement. Fig. 26—The wheel shaped as here shown will grind the parallel and angular surfaces together in correct relation

smooth by running the wheel slide in and out until the diamond ceases to cut.

Then reset the wheelhead to zero, touch the diamond to the periphery of the wheel at the right, note the reading of the micrometer dial on the cross-feed screw, and dress the line *x*, Fig. 26, 0.125 in. below the periphery of the wheel, gaging the distance with the micrometer dial. With the work on centers and line *x* touching but not grinding the already ground diameter *D*, Fig. 16, move the table to the right until the left side of the wheel contacts with the faced shoulder *C*, at which time the grinding of angle *E* is completed. The line *x*, Fig. 26, from the side of the wheel to its intersection with the angular line *y* is exactly 0.125 in. long, having been established with mathematical precision, and this is also the width of the flat surface between the intersection of the angle and the shoulder.

By reversing the work on centers and re-establishing a point of departure lengthwise the angle at *L*, Fig. 16, is ground with the same wheel without change. The diameter is determined by the wheel coming in contact with surface *K*, which was ground to size in a preceding operation. The intersection of *K* and *L* was not definitely established, however, as the wheel used at that time was purposely too narrow to cover the width of *K*, and the angle presented by the side of the wheel was 42 instead of 45 degrees.

Surface *V* represents a condition often found in form tools; an interrupted curve, the center of radius of which is located somewhere outside the contour but not in line,

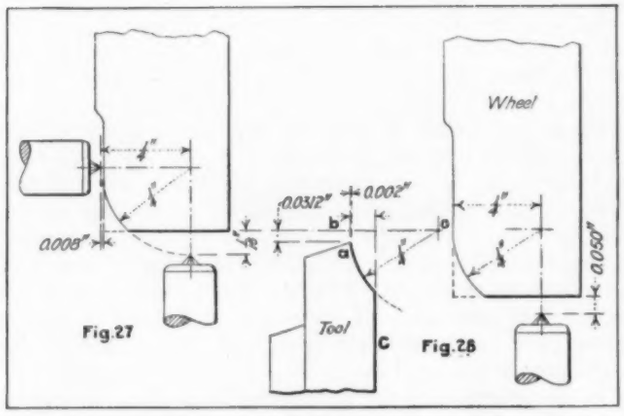


Fig. 27—Setting the radius truing diamond with relation to the wheel to grind a curve intercepted by a straight line on the work. Fig. 28—Another factor enters into the calculation when there is no adjacent surface to serve as a point of departure

either radially or axially, with any measurable surface. Such a surface is impossible to measure upon the tool with any degree of accuracy, either with respect to its diameter or its relation to adjacent surfaces. It is, however, quite easy to measure and to locate it accurately by the means here provided.

In this case, the center of radius is 1.5 in. from the axis and 0.2187 in. from the smaller end of the form tool. These distances are given on the drawing. The arc being interrupted by the parallel surface *W*, this surface naturally becomes a part of the form to be ground in connection with the curve and is therefore combined with it on the grinding wheel, thus reducing the complication.

Deducting 1.5 in. from the sum of the radius of *W* and the radius of the arc to be ground (1.3125 in. ÷ 0.250 in. — 1.5 in. = 0.0625 in.) and this difference from the radius of arc (0.250 in. — 0.0625 in. = 0.1875 in.) we find that the center of radius is $\frac{3}{16}$ in. outside of surface *W*. Similarly, subtracting the sum of the widths *V*, *W* and *X* from the sum of the radius plus the distance between the center of radius and the small end of the tool ((0.0785 in. + 0.0385 in. + 0.3437 in.) — (0.250 in. + 0.2187 in.) = 0.008 in.) we find that the arc is interrupted at a point 0.008 in. from the extended diameter of the tool. It is necessary to know this figure in order to set the diamond for shaping the wheel.

A 60-L disk wheel $\frac{3}{8}$ in. thick can be placed on either end of the spindle as is most convenient, and the periphery and left side are dressed true. The reason for using a wheel so much wider than the surface to be ground, is that a large component of the grinding pressure is imposed in a direction perpendicular to the plane of rotation, and it is necessary to provide sufficient strength to resist it. If there had not been room at the right for a wheel of this thickness, it would have been better to have beveled the right-hand corner than to have risked using a thinner wheel.

With the diamond of the radius fixture set to a radius of 0.250 in. it is first presented radially to the wheel and the reading of the micrometer dial is noted at the instant of contact. It is then swung parallel to the table, touched to the left side of the wheel, and the dial of the indicator on front of the table is adjusted to bring zero under the pointer. The table is now moved to the right to separate the wheel and diamond 0.008 in. as shown by the indicator and allowed to remain in that position.

The wheel is now run back until the diamond will clear the corner, and is again advanced to meet the swinging diamond until the micrometer dial shows a reading 0.125 (corresponding to a movement of the cross-slide of 0.0625 in.) less than the one previously noted. Fig. 27 shows the shape of the wheel at this stage and the relative positions of the diamond at the extremes of its 90-deg. swing.

By touching the periphery of the wheel to any convenient diameter and its left side to any convenient shoulder (as the end of the tool at *Z*, Fig. 16) already ground on the tool, taking the reading of the micrometer dial and setting the indicator respectively thereto, the wheel may be positioned accurately with relation to the tool and the diameter *W* can be ground by feeding straight in to the predetermined mark on the micrometer dial. In grinding surface *W* to size, surface *V* is correctly disposed at the same time.

On many tools there is no convenient adjacent surface to assist in locating a curve. In the example shown by Fig. 28 the width of the curved surface, measured axially, is $\frac{1}{16}$ in., but there is no apparent way to measure its diameter or endwise location. In this case, after preparing the wheel as before and touching the left side with the point of the diamond to obtain the table setting (the indicator may be set after the final run-out of the diamond in truing the side), a radius wider than $\frac{1}{16}$ in. is dressed on the corner of the wheel by advancing it while swinging the diamond; how much wider does not matter.

Upon completing the corner, the reading of the micrometer dial is noted and the wheel is advanced to contact with the radially-presented diamond, when the reading is again noted and subtracted from the previous one. Assuming that the wheel advanced 0.050 in. to make the contact, as in Fig. 28, and subtracting this amount from the radius (0.250 in. — 0.050 in. = 0.200 in.) we know that the center of radius is now exactly 0.200 in. behind the periphery of the wheel.

As the drawing stipulates that this center of radius shall be 0.0312 in. outside the greatest diameter of the tool, we merely put the work on centers, touch the periphery of the wheel to that diameter, move the work to one side and advance the wheel 0.1687 in. (0.200 — 0.03125 = 0.1687), when we again make a note of the dial reading. If precise endwise location is not essential, the curve may now be ground by traversing the table (without moving the wheel) to bring the work in contact with the wheel, and grind until the sharp corner of the tool is $\frac{1}{16}$ in. from the side, as nearly as can be measured with a scale. If, however, precise location is demanded, further calculation is necessary.

Points *o*, *a*, *b*, Fig. 28, represent a right triangle, the radius (or base) of which is 0.250 in. and the side 0.03125 in. The required factor is the versed sine of this angle, or the difference between the cosine and the radius. From the table of sines we learn that the angle is 7 deg. 11 min. (disregarding seconds, which we cannot measure) and from the same table that the cosine of this angle is 0.99215, or 0.24803 in. to a $\frac{1}{4}$ in. radius. Subtracting this from the radius (0.250 in — 0.248 in. = 0.002 in.) we find that the left side of the wheel must occupy a position 0.002 in. to the left of the corner.

Bringing in the wheel to overlap face *c* of the tool and touching its left side to that face, we set the dial indicator of the table to zero. Running back the wheel we move the table to the right 0.0625 in. + 0.002 in. = 0.0645 in. and again advance the wheel to the original position.

Ball Bearing Mounting Methods

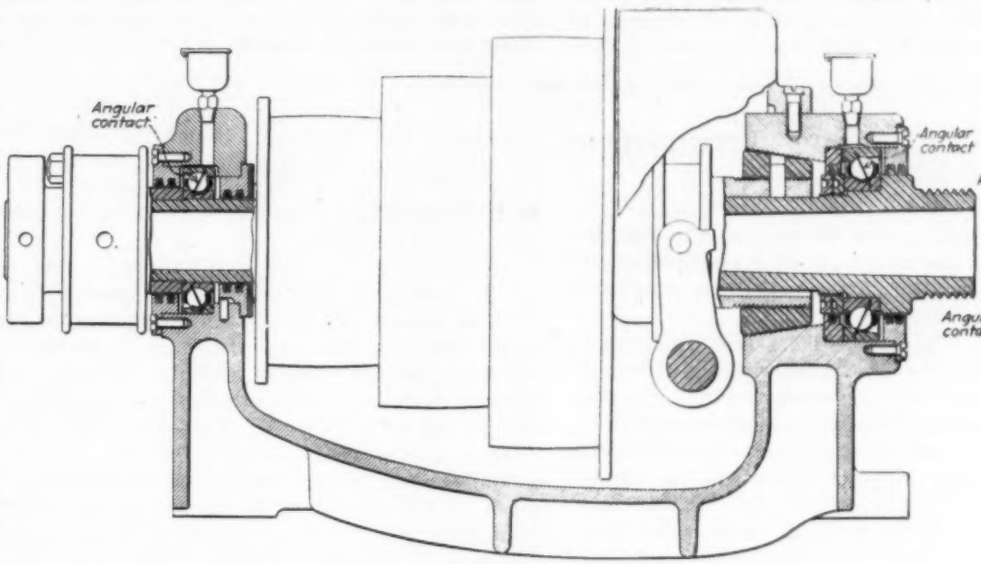


FIG. 1

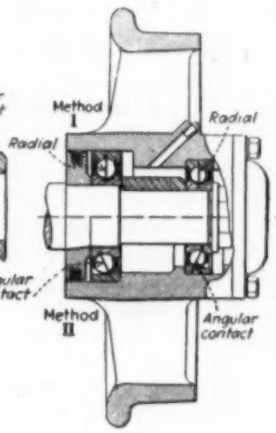


FIG. 2

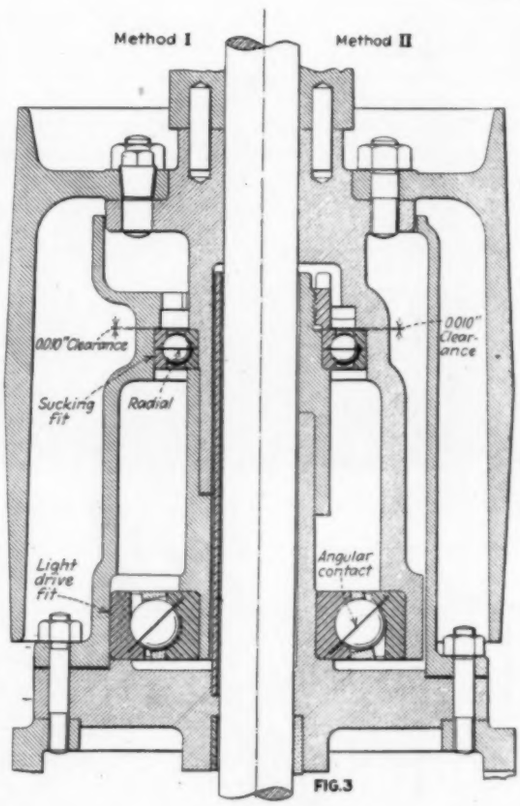


FIG. 3

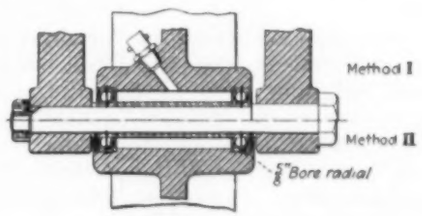


FIG. 4

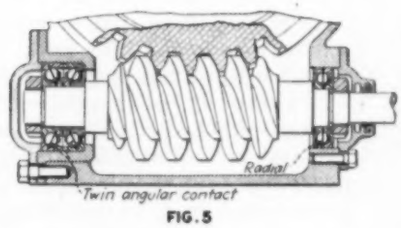


FIG. 5

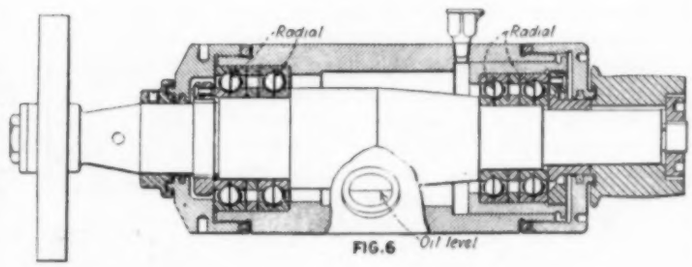


FIG. 6

Fig. 1 — Ball-bearing mounting for the headstock of a lathe. Bearings have a light drive fit on the spindle and a press fit in the housing. Fig. 2 —Bearing mounting for a mine car wheel. Radial bearings have a light drive fit on the shaft and in the wheel hub. Angular contact bearings have a light drive fit on the shaft and a press fit in the wheel hub. Fig. 3— Mounting for the shaft of a deep well pump. Fig. 4 — Mounting for the wheel of a hand truck. Bearings have a light drive fit on the shaft and on the housing. Fig. 5 — Bearing mounting for the wormshaft of a gear reduction unit. Fig. 6—Mounting for the spindle of a small grinder

Courtesy of the Strom Bearings Company

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IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

An Unorthodox Clamping Arrangement

By P. A. Newman

While there is nothing new in the use of pneumatic clamping devices, in the designing of a multiple spindle machine, I recently had occasion to make what was to me a novel application of such a system.

It was required to finish machine a large quantity of meter covers such as the one shown in Fig. 1, in one set-up by milling, drilling, counterboring and reaming. Owing to the thinness of the walls of the covers, they could not be used as clamping surfaces without having the clamps project into the inner part of the casting and interfering with the operation of the various tools. Therefore, it was decided to turn the work upside down and to present some of the tools from below and others from above.

Under ordinary conditions this arrangement would necessitate two motions—one lifting and one lateral—in loading and unloading. To facilitate this part of the work being done in the shortest possible time, it was considered advisable to design the clamping devices so that but one motion, that of lifting, would be required in loading and unloading. Hence the clamping arrangement shown in the illustrations. The design of the work-carrying fixture finally took the form of a rotating table having three stations and three sets of clamps. The work rested upon hardened plates, as at *A*, Fig. 2, cut away to give approximately a three-point bearing. The table was mounted on the machine at an angle of 60 deg. from the horizontal, giving a good chip drop, so that all parts of the machine could be kept clean. The fixture was rotated 120 deg. at each revolution of a camshaft by means of a trip-operated gearbox, and with a camshaft speed of 2 r.p.m. The production was one finished piece every 30 seconds. Each station was provided with two air-cylinders, the pistons of which operated the clamps, and each pair of cylinders had its individual cock to control the air, as shown at *B*. The position of the clamps is dependent upon the relation of the parts in the taper plug to the air supply. The construction and loading and working positions can be clearly understood from the drawing, and it will be appreciated that the main aim of the design is to have the clamps clear the work through the action of the links *C*. By reason of links swinging on the pins *D*, carried by a pair of lugs on the cylinder head *H*, the clamps *J* are carried to and from the work as the direction of the pressure is changed.

In operation, pressure being applied to the underside of the piston, the trunnion *K* commences to rise in a vertical plane. This increases the horizontal distance *L* due to the links hinging on the pin D, at the same time however, the movement of links *C* being radial, the clamps *J* are carried over to the work, ultimately making contact and holding it. Pressure being applied in the reverse direction causes the trunnion to descend and thus commence to decrease the distance *L*. The radial movement of links *C* having the reverse action to that already described, the clamps come to rest quite clear of the component.

The relation between the noses of the clamps and the positions of the cylinders can be set to accommodate slight variations in casting depths by means of the screwed connection between the piston rods and the trunnions, which must afterwards be locked. The piston *M* is integral with its rod and is provided with the adjusting ring *N* to regulate the metallic packing employed.

The cylinders *O* are tight press fits in the fixture cast-

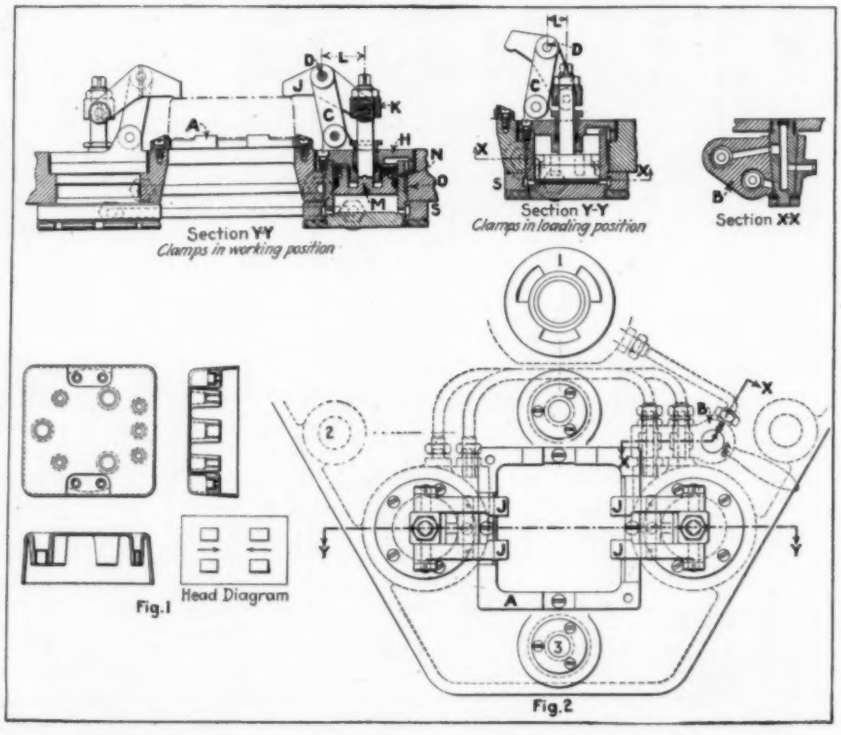


Fig. 1—A meter cover showing the parts to be machined. Fig. 2—The indexing fixture showing the arrangement of the clamps

ing and have grooves cut on the outside which allow air to pass through the ports shown in the cylinder head, for unclamping. The rings *S* are press fits on the cylinders and allow air for clamping to pass from the connections integral with them into the grooves cut on the insides and through to the undersides of the pistons.

It will be noticed that the connections on the cylinders nearest the cocks are extended to provide a suitable means of mounting. The cocks are bored to fit over these extensions and by means of the grooves turned in their bodies and the holes in the peripheries of the extensions, the air supply is common to both cylinders. Also, the ports in the taper plugs are so arranged than when one of the pipes is open to the main, the other is free to exhaust.

Grinding Fixture With Automatic Clamps

By Frank Waldo

In Fig. 1 is shown a double-spindle grinder equipped with an automatic-clamping, revolving work-carrier for grinding hardened steel rolls to length. The operation requires the removal of approximately 0.003 in. of stock from each end, the limit for length being 0.00025 in.

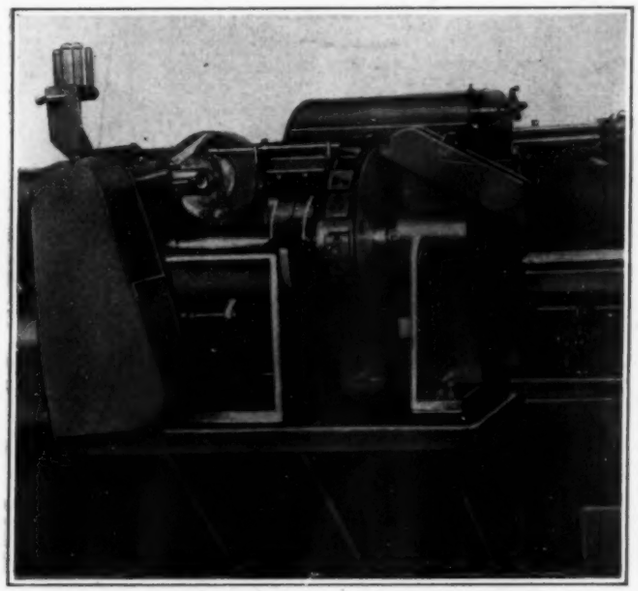


Fig. 1—Grinding both ends of steel rolls simultaneously

Details of the roll are shown in Fig. 2. Grinding is done wet by two 20-in. abrasive disks. The revolving carrier, or drum, has twenty stations, each of which is provided with a pair of hardened and ground clamping jaws. The drum is 20 in. in diameter, 2 in. wide, and is attached to a 5-in. spindle mounted in roller bearings. The spindle is driven by a separate motor through worm gearing.

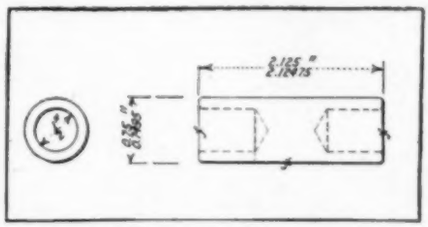


Fig. 2—Details of the work to be ground

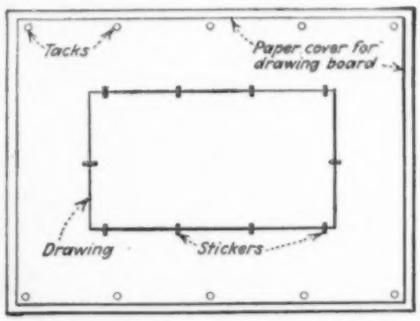
Projecting within the drum is a stationary cam that automatically opens and closes the clamping jaws of each station. The drum is loaded by hand and two side guides align the pieces so that they are centered between the abrasive disks. As the drum rotates, the rolls are automatically clamped. After the pieces have passed between the wheels, the clamps are released by the cam, and an automatic knock-out, timed in relation to the rotation of the drum, ejects them into the chute shown at the right of the drum. The production is 30 pieces per min. With certain variations in the carrier drum, the set-up can be used for grinding the ends of piston pins, valve tappets, bearing rolls, and similar parts.

Staples for Holding Paper on Drawing Boards—*Discussion*

By H. L. Wheeler

The suggestion of using staples for holding paper on the drawing board, given by I. B. Rich in an article under the title named above, on page 591, Vol. 68, of the *American Machinist*, reminds me of an unusual method employed in a drafting room that I know. The method appears to me to have many advantages over the conventional thumb-tack system. Also, I believe it has something on the staple.

This drafting room employs gummed cloth stickers as shown in the accompanying sketch. The gummed cloth comes in small rolls of varying widths, 1 in. being about the right width for this purpose. The draftsman cuts off, crosswise, strips about ¼ in. wide. They are applied to the paper in as many places as desired or needed. In this drafting room the use of thumb tacks is absolutely prohibited except for holding the cover-paper on top of the board.



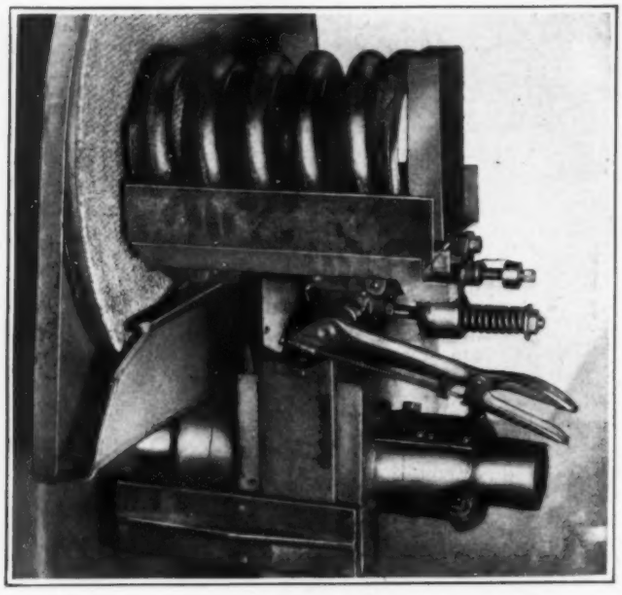
Holding drawing paper by gummed stickers

Most of the drafting is done directly on white tracing paper, and the gummed stickers seem to hold it quite as well as thumb tacks. The stickers have the additional advantage of offering no obstructions to the T-square and triangles. It is also a considerable advantage not to have the drawing boards punched full of holes, such as one finds in the average drafting room. The stickers are easily removed without tearing the paper by careful use of a safety razor blade.

Grinding the Ends of Car Springs

By C. W. Frank

In the accompanying illustration is shown a set-up for grinding the ends of car springs, measuring 9 in. in diameter and made of $1\frac{9}{16}$-in. diameter material. The work is located in the fixture attached to a mechanically-oscillated work table of a Gardner grinder, and is held against the abrasive disk by means of a spring, the tension of which is adjusted to suit the area of the surface being ground. The spring is backed up by an upright member atttached to the fixture, as shown at the right. The work table is driven through worm gearing located



A set-up for grinding the ends of car springs

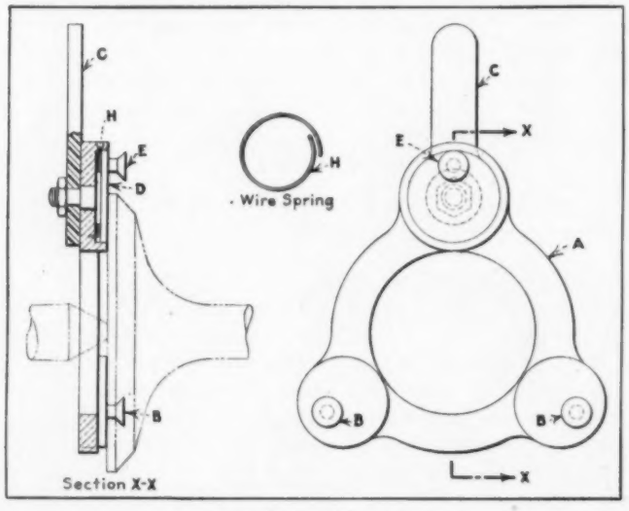
at the rear of the base and housed in a gear box. In operation, the table is caused to oscillate automatically on a rocker shaft, so that the work passes back and forth against the face of the abrasive disk, thus eliminating hand operation.

The amount of material removed from each end of the spring varies from $\frac{3}{32}$ to $\frac{1}{8}$ in., and an output of 45 to 50 ends per hour is obtained. The procedure in grinding the work is to finish a number of springs at one end, and then to adjust the limit stops on the machine so that where the opposite ends are ground the springs will be of the desired length.

A Dog for Use on the Grinder

By J. Waitkus

The grinding of several thousand valve stems necessitated the use of a special dog in order to facilitate and speed-up production. It also eliminated any possibility of denting or marring the valve head, which would be the case if a lathe dog of the ordinary type, in which the work is held in place by a setscrew, were used.



A quick-acting dog

The device consists of the frame *A*, to which the two pins *B* are fastened permanently. The valve head is placed so as to rest on these two pins, the shape of which is made to conform with the contour of the valve head. The valve is then placed between centers. The lever *C*, attached to the stud *D* by a nut, is actuated by a pin fastened in the faceplate. As this pin strikes the lever it moves the stud around and causes the pin *E*, which is fastened eccentrically to the head of the stud, to press the valve head against the two stationary pins *B*. By this means the valve is held firmly at three points during the grinding operation, and the pressure is not great enough to mar the work.

When the grinding has been finished, the pin in the faceplate is moved back from the lever *C*, and the spring *H*, having one end fastened to the stud and the other end to the frame, rotates the stud and brings pin *E* back to its normal position, permitting the valve to be removed and replaced by another one.

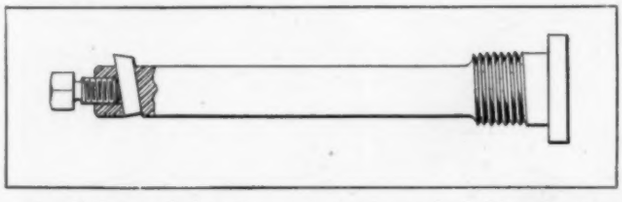
This type of dog permits rapid production by not having to tighten and loosen a setscrew, as is the case with the common type of lathe dog in general use.

A Splining Tool for the Shaper
Discussion

By R. Cowan

In an article under the title given above on page 350, Vol. 68, of the *American Machinist*, Ben West described a splining tool that has to be held to its cut by hand, if used on hard material.

The tool shown in the illustration takes the place of



A splining tool that does not require to be held to its cut

the toolpost and the nut on the threaded part holds it to the clapper. Since the cutting is at the top of the bar, the pressure of the cut is downward and the tool does not have to be held. The only precautions necessary are not to give the tool excessive top rake and to set the stroke of the ram so that the tool just breaks through the work.

Driving Small Screws

By Frank V. Faulhaber

A goodly bit of time often is involved when inserting small screws in certain pieces of machinery. A screw driver is not always serviceable in getting the screw started, and the use of fingers is often a waste of effort, beside being a tax on the machinist's patience. The problem is easily solved by paring down the end of a match stick, or piece of wood of similar size, just enough to fit the slot in the screw head. Moisten the end first, put it into the slot, then start the screw. A good hold is possible because the wetted match stick swells. When the screw is well on its way, use a screw driver to complete the job. The tiniest of screws can be driven by this method.

· TECHNICAL · ABSTRACTS ·

Simplification and Standardization in Europe

The amount of work being carried on in Europe in the fields of simplification and standardization is astonishing. Before the war, the British Engineering Standards Association was the only national body of its kind in Europe. Today, there are at least sixteen such national bodies and the other countries have some sort of activity under way. The greatest activity is by the Germans and English.

The Germans have established more than 2,100 standards, mostly dimensional, with relatively little emphasis on quality specifications and tests. Practically all of the large and medium sized firms in Germany are taking an active part in this development. In order to bring the established German standards into general use as quickly as possible a number of important German firms have agreed not to charge up to buyers of standardized goods and parts the cost of introducing new tools for their manufacture.

Standardization in Great Britain is progressing at a somewhat slower rate than in Germany and the United States, about 500 standard specifications having been issued. However, over 50,000 copies of these specifications are sold annually, and a considerable sum of money has been appropriated to have them translated into foreign languages to increase the market for British goods.

The work by the other European countries is by no means to be ignored. Much of the European work is being done with the foreign market in mind, and is worthy of careful study by manufacturers in the United States.—Victor S. Karabasz, *The Annals of the American Academy of Political and Social Science,* May.

Pot Furnaces and Baths for Ideal Heating

The characteristics of a satisfactory bath material for hardening or tempering carbon steel are; it must not deteriorate under constant use up to 1,800 deg. F., and it must not decarburize, carburize or pit the steel while in the bath, nor cause rusting upon removal therefrom. These are the chemical characteristics. The physical qualities of the material are of equal importance in determining the heat-treatment.

Perhaps the most important physical characteristic is the freezing of the fused salt upon immersion in a bath to cause an insulating jacket which, before it melts, has caused sufficient time lag to prevent too-rapid heat transfer. When the steel reaches a temperature of 1,300 deg. F., it is surrounded by a rapidly circulating liquid of low viscosity, so that heat equilibrium is maintained throughout the bath. No oxidation is possible.

One of the commercial fused salt tempering materials has a temperature range of 275 to 1,200 deg. F. in the liquid condition. By its use it is possible to adapt the heating bath so that uniform rates of heating and cooling can be maintained. This feature permits reproducible results when determining the proper heat-treatment of tool steels.

Recent developments in pot furnace design have caused such equipment to become very efficient and highly productive. Designs now incorporate burners so located that not only the bottom but the sides of the pot are uniformly heated to the same temperature. These burners are capable of very fine adjustment for temperature and furnace atmosphere regulation. Low installing and operating costs are features of these heating equipments which effect large economies through their efficient action.—A. E. Bellis, *Industrial Gas,* June.

Non-Ferrous Metals Adversely Affect High-Speed Tool Steel

Research on high-speed tool steel containing antimony, arsenic, copper and tin showed adverse effects from such inclusions. The steels were of the low-tungsten, high-vanadium type, and contained up to 1.7 per cent antimony, 0.8 per cent arsenic, 1.8 per cent copper, or 1.8 per cent tin.

Each of these four elements adversely affected the hot-working properties of the high-speed steels, but several tenths of 1 per cent of antimony or arsenic, around 0.8 per cent of copper and relatively high proportions of tin were required before noticeable effects were produced. All of the high-speed steels could themselves be readily machined when in the annealed condition except the steel containing about 1.8 per cent copper.

Small additions of antimony, arsenic, copper and tin, around 0.1 to 0.4 per cent, did not materially affect the grain size of the samples oil-quenched in the ordinary manner from 2,350 deg. F. Increase in copper content tended to increase the grain size while increase in antimony, arsenic or tin tended to reduce the grain size.

The Rockwell hardness of the high-speed steel was not appreciably affected by the additions of antimony, arsenic, or copper when the steels were subjected to comparable heat treatments under a wide range of conditions. Additions of tin produced no appreciable effects except when the steels were oil-quenched from 2,000 deg. F. The hardness increased with increase in tin up to about 0.57 per cent; further increase in tin resulted in a decrease from the maximum hardness.

The effects of each of the elements, antimony, arsenic, copper, and tin, on tool performance were relatively small in rough turning and did not correspond at all to the effects observed in finish-turning tests under light cuts and high speeds. Large proportions of tin, 1.8 per cent, appreciably reduced the Taylor speeds in rough turning while no appreciable changes were observed with copper up to 1.8 per cent, antimony up to 0.4 per cent, or arsenic up to 0.8 per cent.

Each of the four elements appreciably reduced tool life in the finish-turning tests. Copper was the least harmful; next in order came tin and arsenic, while antimony produced the greatest reduction in tool life.

The permissible limits for each of the four elements under consideration and the magnitude of the effects they produce appear to depend largely upon the character of the service for which the high-speed steels are intended. The character of the results indicates that each of these elements should be kept at low limits when general service is considered. For rough turning, small amounts of antimony, arsenic, copper or tin seem much less important.—*Transactions* of American Society for Steel Treating, June.

Heat-Treatment of Aluminum and Its Light Alloys

Some aluminum alloys age-harden spontaneously on standing at the ordinary temperatures after quenching, whereas others require reheating at a slightly elevated temperature in order to effect adequate precipitation of the dissolved constituents. The process of precipitation at a slightly elevated temperature is referred to as "artificial aging." Duralumin and other aluminum alloys containing magnesium silicide (Mg_2Si) will age-harden at the ordinary temperature after quenching, while those containing no magnesium silicide but variable percentages of $CuAl_2$ require artificial aging. Duralumin may, of course, be aged at a slightly elevated temperature, the effect of this being to speed up the rate of hardening. Duralumin will age-harden fully on standing for four days at room temperature after quenching. Variable mechanical properties may be obtained at will for a given alloy by variation in the conditions of the aging process.

The usual aging temperatures employed for wrought alloys lie in the range 248 to 320 deg. F., while cast alloys may be aged up to 455 deg. F. As a rule, it is preferable to use longer times of aging at lower temperatures rather than short times and higher temperatures. The former combination gives the better mechanical properties.—Robert J. Anderson, *Fuels and Furnaces,* June.

American Machinist

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Established 1877

We Are Offered Herbert Hoover

WITH the nomination of Herbert Hoover for the Presidency there is given this country its first opportunity to choose as chief executive an engineer and business man. It is probable that his administration, if he is elected, will stand out in economic history as his administration of the Department of Commerce now does.

Hoover is not a politician; he has always been too busy actually doing things to afford time to study politics. Of political economy, however, he is a natural master. "A new era and new forces have come into our economic life and our setting among nations of the world. These forces demand of us constant study and effort if prosperity, peace and contentment shall be maintained." These statements, addressed to the convention by Mr. Hoover, are not idle words. His knowledge of economic forces is extensive and his experience with them has been acquired over the greater part of the world. He thinks internationally.

Yet primarily his efforts in public life have been for his own country. In it he has complete faith. To him it is the one land of unlimited opportunity, the only country where industrial achievements such as ours can be attained. "You convey too great a compliment when you say that I have earned the right to the Presidential nomination. No man can establish such an obligation upon any part of the American people. My country owes me no debt. It gave me, as it gives every boy and girl, a chance. It gave me schooling, independence of action, opportunity for service and honor. In no other land could a boy from a country village, without inheritance or influential friends, look forward with unbounded hope." It is in these social conditions that Mr. Hoover sees our industrial and moral strength.

How much of our business success during the past seven years is due to the Secretary of Commerce cannot be determined. There is no way of knowing what our industries might have done without the program of the elimination of waste instigated by the Secretary; without that standardization and simplification for which his Department has been responsible; and without that knowledge of conditions in foreign countries which the Department's trade commissioners have collected. What is known is that business now depends upon low cost of production of its products for both domestic and foreign consumption, and that it is now certain of its facts concerning export opportunities. With great waste, with unlimited sizes and varieties, without extensive standardization, the necessary low costs could not be obtained.

Many of the constructive activities of trade associations may be traced back to the Secretary of Commerce. He has been an exponent of group co-operative activities; has never been fearsome of the "business cycle"; in fact has helped to level the business curve by fostering programs that have done much to bring about more nearly continuous employment and to reduce seasonal activity. That American business is constantly increasing its demands for services from the Department of Commerce is indicated by the fact that the number of commercial services rendered by the Bureau of Foreign and Domestic Commerce in the United States has grown from 8,000 weekly in 1921 to about 60,000 at present.

Herbert Hoover is a known quantity, having been proved on the executive type of service for which he is now proposed. His election will insure the same successful direction that he has shown in feeding millions, in directing flood relief, and in building business.

Unwarranted Inquisitiveness

ONE of the most aggravating habits of a certain type of equipment buyer is his insistence on knowing how much profit the seller is making on the deal. He seems to feel that there is something immoral about the transaction if more than a very moderate profit is received by the party on the selling side.

This attitude is quite inexcusable, of course, but there may be ways to explain it. For instance, it was not so long ago that the average employer was convinced that no man in his employ should receive more than a certain moderate amount of wages. If an energetic workman pushed up his earnings under a piece-rate system until he was getting more than the average he was promptly informed of his rashness by a cut in rate. Perhaps this state of mind afflicts the kind of buyer under discussion.

Or, perhaps, he is actuated by the highly moral purpose of the prohibition "snooper," or the censor of public morals. If so, Heaven help the salesman!

· SHOP · EQUIPMENT · NEWS ·

Coulter Single-Spindle Diamond-Tool Boring Machine

A SINGLE-SPINDLE Coulter diamond-tool boring machine, shown in the accompanying illustration, is being placed on the market by the Automatic Machine Company, Bridgeport, Conn. It is designed to meet a demand for a precision boring machine adaptable for a variety of work, since the double-spindle boring machine of this company is a single-purpose machine, especially intended for the accurate automatic boring of connecting rods and pistons on a large scale. The double-spindle machine was described on page 73, Vol. 65, of the *American Machinist*.

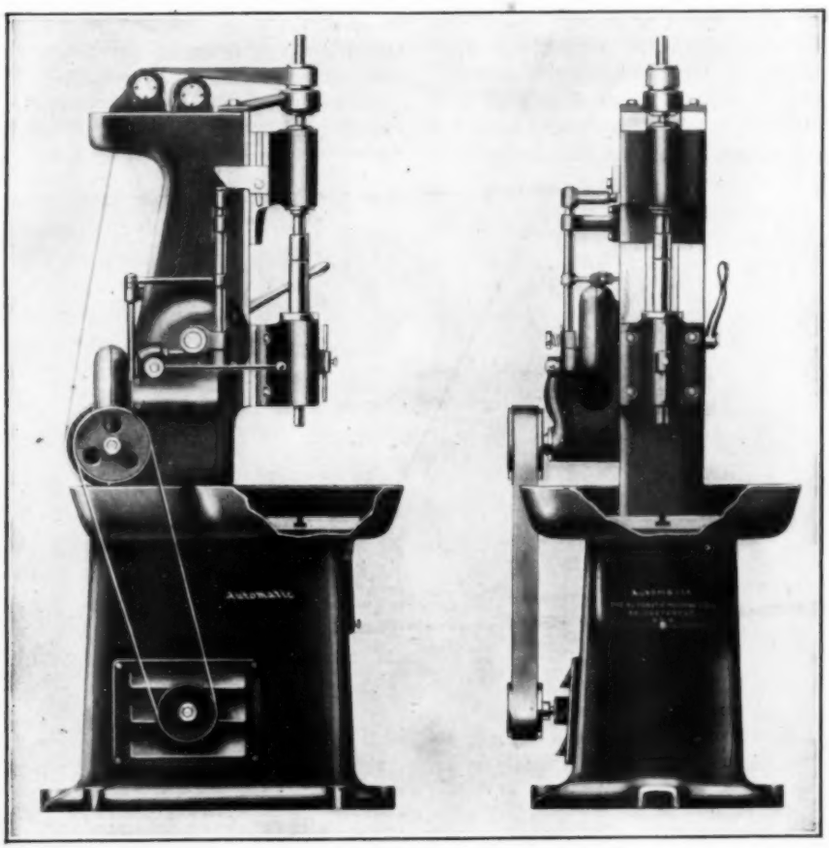
The single-spindle boring machine is adapted to the accurate finish boring of non-ferrous bushings, bearings, valve bodies, or finely-finished accurate small parts. The spindle end is arranged with an internal accurate thread and taper pilot so that the diamond boring tools can be mounted in detachable holders and readily changed to suit the varying work. The machine is essentially a counterpart of the double-spindle diamond boring machine, but is intended for a wider range of work.

The column of the machine is a box section, having the 3-hp., 1,800-r.p.m. motor placed inside the base with only the pulley projecting. The feed mechanism is located between the sides of the column above the splash pan. The driving spindle is run in a bronze bearing approximately 9 in. long. The journal is tapered, with a large diameter at the upper end of the bearing, and the spindle is provided with a ring-adjusting nut to compensate for any wear of the bearing. Ball-bearings sustain the radial load produced by the tension of the belt, thus relieving the lower bearing of any lateral strain. The spindle and boring bar are lapped on their bearing surfaces.

The boring bar is separate from the driving spindle and is attached to the driving spindle by means of a special floating coupling of the Oldham type, having taper shanks extending into taper holes in the spindle and in the boring bar.

In the cycle of operation, the boring spindle is brought to the boring position manually by means of the lever at the right, and the starting lever is then tripped, causing the boring spindle to rotate and the automatic feed mechanism to come into operation. The boring continues to a pre-determined depth, at which point the machine stops automatically. The operator then returns the boring spindle to the starting position manually, by means of the quick-return lever.

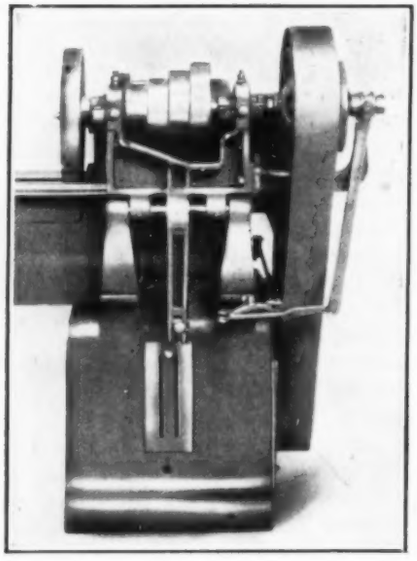
The operating speed of the spindle is about 4,000 r.p.m., although this can be varied by changing the spindle pulley. Provision has been made for the use of a wide variety of work-holding fixtures on the platform. The fixture platform measures 12x22 in., and the distance between the spindle bearing and the platform is 12 in. The spindle throw is 6 in., so that boring can be done to a depth of 6 in., and to any reasonable proportionate diameter. The floor space occupied by the machine is 30x36 in. and the weight is 2,500 pounds.



Left—Side view of the Coulter Single-Spindle Diamond-Tool Boring Machine showing drive from the inclosed motor. Right—Front view showing control lever

Motor Drive for Sebastian Cone-Head Lathes

A motor drive for the cone-head lathes of its manufacture has been developed by the Sebastian Lathe Company, Cincinnati, Ohio. The motor is built into the cabinet base under the headstock. As shown in the illustration, the cone pulley is supported by a box-type bracket placed in line with the headstock cone so that it does not shut off light from the work. Starting and stopping of the machine is effected through a friction pulley controlled from the apron. The adjustment of the belts

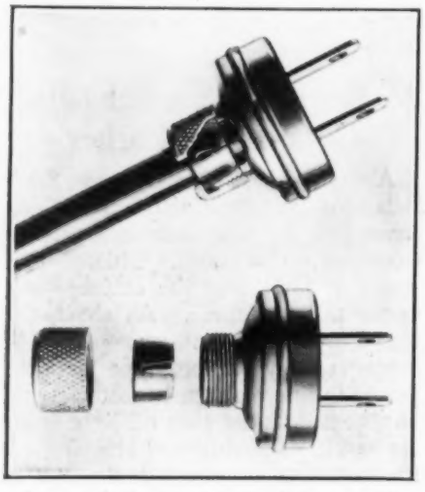


Motor Drive for Sebastian Cone-Head Lathes

is accomplished by means of a handwheel placed on the front of the machine. Cast-iron guards surround the driving belt as can be seen in the illustration.

Cutler-Hammer No. 7784 Cord Grip Plug Cap

An unbreakable attachment plug cap with an improved type of cord grip has been announced by the Cutler-Hammer Manufacturing Company, 80 Twelfth St., Milwaukee, Wis. The cord grip acts as a positive strain relief and is designed to lessen short-circuit hazards. Fastening the cord grip is a simple matter, and can be done without the use of tools. It is only necessary to screw down on the knurled collar shown in the illustration.



Cutler-Hammer No. 7784 Cord Grip Plug Cap

The knurled collar wedges a fiber bushing tightly against the cord. The parts are so designed that when screwed together they resist loosening of the knurled collar, and insure a firm grip at all times. A fiber grip bushing serves to insulate the cord from metal parts and to prevent damage to the cord. This bushing also acts as the clamp, and is the only part that actually touches the cord.

A rustproof armored shell, made of heavy brass, prevents damage when the cap is dropped. Sheet Bakelite is used to hold the blades firmly in place. The cord grip cap presents an excellent appearance and can be obtained in Bakelite, either brown or zinc-gray finish.

Norton Type BA 14x36- to 14x120-Inch Cylindrical Grinding Machines

SEVERAL additional sizes of the type BA cylindrical grinding machine to swing work 14 in. in diameter have been announced by the Norton Company, Worcester, Mass. These machines supplement the type BA 14x24-in. grinding machine described on page 363, Vol. 67, of the *American Machinist*. Many improvements have been incorporated in the later machines which are made in standard sizes from 14x36 in. to 14x120 inches.

Such pieces as car axles and crankshaft bearings are typical of the work for which these machines were designed. Ample space has been provided for work with flanges or other projections up to the full capacity of the machine, and when steady rests are necessary, pieces as large as 6½ in. may readily be ground. In Fig. 1 one of the smaller sizes of these cylindrical grinders is shown. In Fig. 2 a rear view of one of the larger machines is shown.

Many of the features of previous successful designs have been adapted to this line. Among these are the wheel spindle, ball-bearing wheel feed screw, chain drive headstock, selective-gear speed change mechanism and anti-friction countershaft bearings on the overhead drive arrangements. The machine may be had with either an all-overhead or a motor drive arrangement and with either power or hand table traverse.

The improved wheel spindle shown in Fig. 3 is designed to withstand severe service and to meet the requirements of precision grinding. It is simply constructed and arranged to require a minimum amount of attention. It is made from specially heat-treated alloy steel and is of large diameter with long bearings. Wide-wheel straight-in cuts as well as traverse grinding may be accomplished.

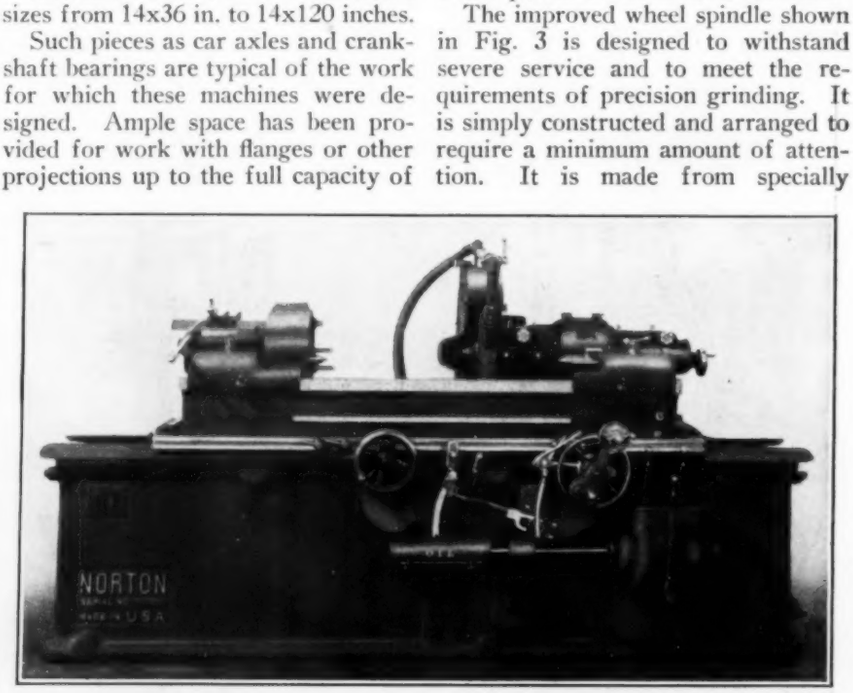


Fig. 1—Norton Type BA 14x36-Inch Cylindrical Grinding Machine

Adjustment of the bearings while the machine is in motion is possible due to their design. The lower bear-

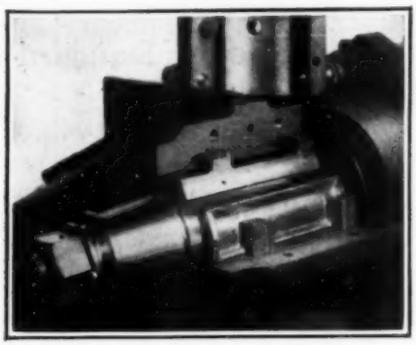


Fig. 3—Close-up of the improved wheel spindle

ing is fixed and the upper and outer bearings are adjustable by means of thumb screws which are easily accessible. Flood lubrication visible through glasses on front of the wheelslide insures an ample and continuous supply of oil for the spindle.

Massive construction marks the entire wheelslide, which has long and wide ways. The wheel is driven through a downward pull of the belt which combined with the weight of the slide itself eliminates the possibility of lifting under the pressure of a heavy cut. The wheel is advanced to the work in increments of one-eighth of a thousandth of an inch by means of a micrometric arrangement. The wheel feed has a large diameter screw mounted on ball bearings engaging a long half nut on the wheelslide.

A convenient speed changing device on machines arranged with power table traverse encourages the use of proper speeds, reduces the operating time and tends to increase production. The speeds are changed through a selective gear speed mechanism. All changes are made at the front of the machine and can be effected without stopping the table, work or wheel. An independent device permits truing the wheel without disturbing the lever for the regular table speed changes.

Either belt or motor drive on the headstock is available. Power is transmitted to the drive plate through a silent chain provided with an idler to maintain the proper tension for which a convenient control is located on the front of the machine. Any of the attachments or mechanisms for the 14-in. type A equipment may be used on this model.

Screw or lever types of footstocks are ordinarily supplied with the machine, but for special work air- or crank-operated styles are available. All models are equipped with a large spindle and center.

Brown & Sharpe Micrometers

Two types of micrometers have been announced by the Brown & Sharpe Manufacturing Company, Providence, R. I. The No. 276 inside micrometers are made in three

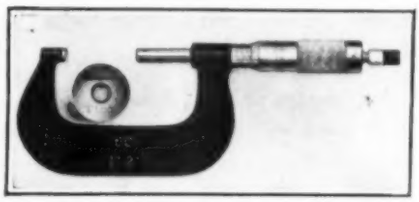


Fig. 2—Brown & Sharpe No. 60 Micrometer Caliper measuring from 1 to 2 in. by thousandths

sizes to measure respectively from 12 to 22 in., 22 to 32 in., and 32 to 42 in., by thousandths. Nos. 60 and 62 micrometer calipers measure from 1 to 2 in. and from 2 to 3 in., respectively, by thousandths.

The range of measurement of each of the No. 276 inside micrometers, one of which is shown in Fig. 1, is obtained by ten changeable anvils of different lengths. The shoulders of the anvils fit against the shoulder of the micrometer head, insuring positive adjustment to accurate measurements. They can be changed easily and are held in position by a clamp screw fitting into a V-groove. Because of their tubular construction, these micrometers are light and easy to handle, and can be quickly and easily adjusted. They can be locked at any reading. The measuring

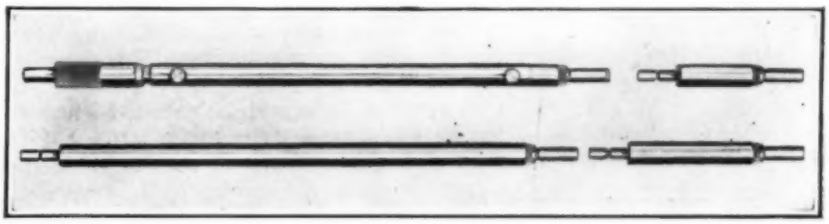


Fig. 1—Brown & Sharpe Inside Micrometer No. 276 with anvils

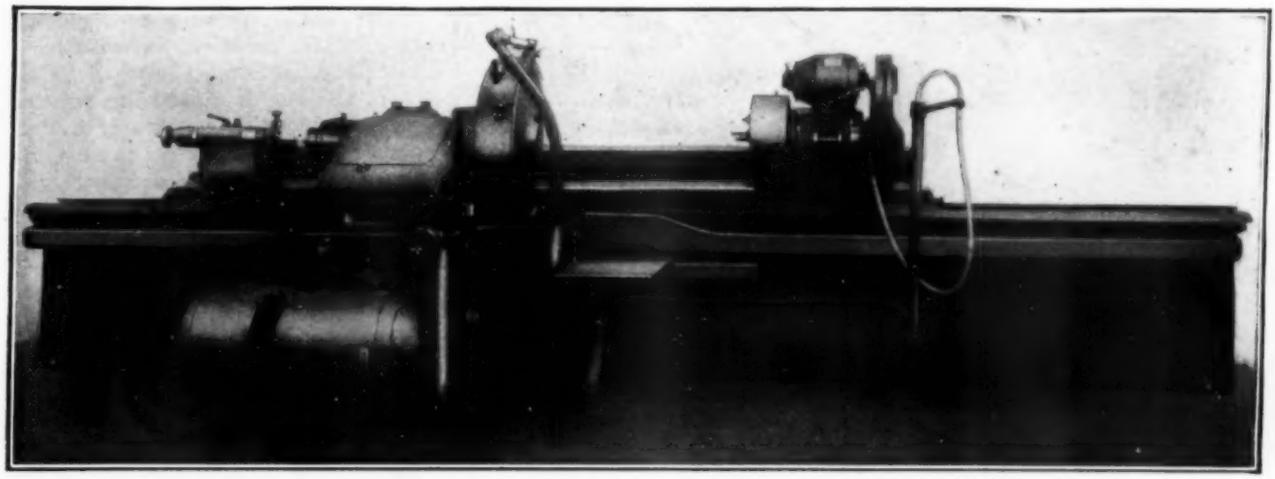


Fig. 2—Rear View of a large size Norton Type BA 14-Inch Cylindrical Grinding Machine

points are hardened and the faces are ground on a radius.

Both micrometer calipers, No. 60 being shown in Fig. 2, are equipped with solid anvils and have a simple adjustment for wear of the measuring surfaces. They can be furnished with or without standards and with or without ratchet stops. They do not have clamp rings.

Cochrane-Bly 48-Inch Metal Sawing Machine

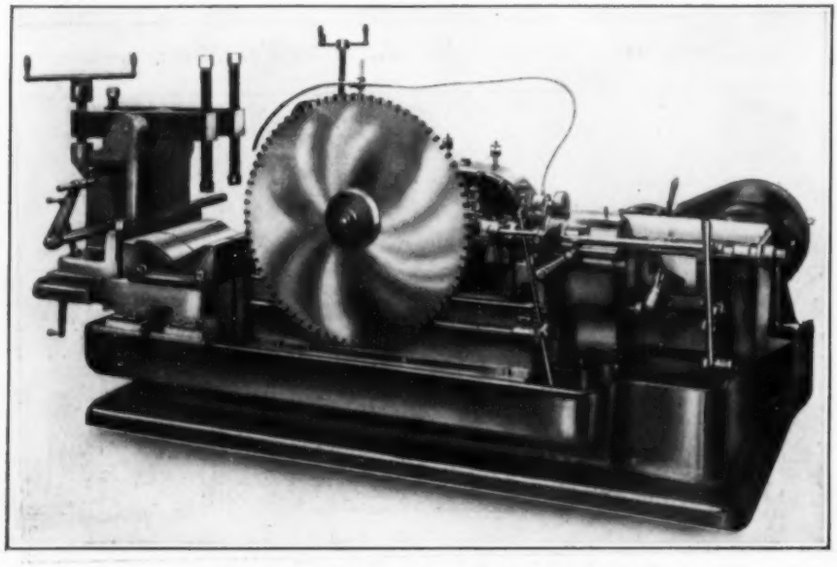
EITHER a 42- or a 48-in. metal-cutting saw can be used on the sawing machine which has been announced by the Cochrane-Bly Company, Rochester, N. Y. The 42-in. saw will cut through a 15-in. bar and the 48-in. saw will cut an 18-in. bar.

The carriage is a solid casting, and is fitted with adjustable taper gibs to compensate for wear. To insure correct alignment and fit, the bed is scraped. The feed screw is mounted above the ways in line with the center of the saw arbor and close up to the saw blade in line with the cutting and frictional resistance so that the tendency to vibrate is minimized. The saw arbor is 6 in. in diameter, hardened and ground, and fitted into a lapped bearing located close to the bed. The feeds are geared and the twelve changes range from $\frac{3}{4}$ to $3\frac{1}{4}$ in. per minute.

The machine has a sliding gear transmission through steel gears running in oil, giving three changes of 45, 60 and 75 ft. per minute. It is driven through a hardened nickel-steel arbor gear and pinion having herringbone teeth, and running in a bath of oil. The worm is made from hardened steel and the worm gear from phosphor bronze.

A 25-hp. constant-speed motor drives the machine through a friction clutch which is controlled by levers placed at both front and rear. At these points are also placed the levers and cranks for starting, stopping and reversing the feeds and adjusting the carriage to and from the work. Adjustable collars are provided to automatically stop and reverse the feed, giving quick return of the carriage to a point where the saw clears the bar being cut. The friction clutch permits quick stopping of the saw without stopping the motor and eliminates the possibility of damaging the saw by moving a loose bar.

A recent test of this machine shows that a 15-in. bar of low-carbon steel can be cut through in 10 min.; a 10-in. bar in $4\frac{1}{2}$ min.; and a 6-in. bar in $1\frac{3}{4}$ min., or at the rate of about 18 sq.in. per minute. The saw used was 42 in. in diameter with a $\frac{5}{16}$-in. kerf. Floor space required when the machine is belt driven is 69x141 in. and when motor driven 84x141 inches.

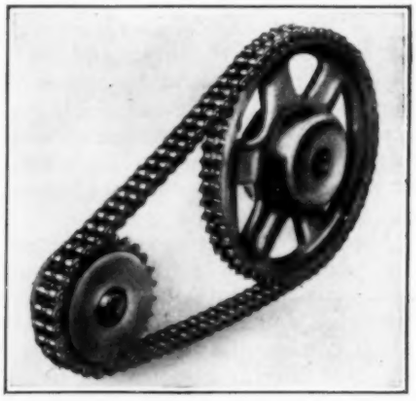


Cochrane-Bly 48-Inch Metal Sawing Machine

Renold-Boston Standard Chain Drives

The Boston Gear Works, Inc., Norfolk Downs, Mass., has just perfected a series of standardized chain drives from 1 to 100 hp. in roller and silent type. They are marketed by the Boston Gear Works Sales Company, and being standardized, may be obtained direct from stock.

By consulting the company's new book, "Renold-Boston Chain Drives," the right chain drive can be readily selected for the particular job. Simplified selection charts are provided in the book by the use of which a chain user can locate the listing of the correct standardized chain drive.

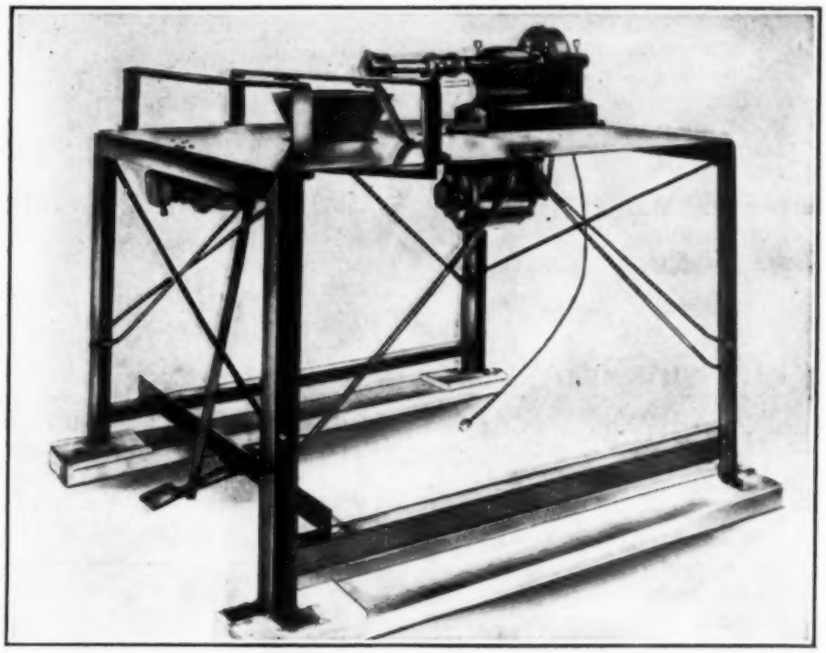


A typical Renold-Boston Standardized Chain Drive

Procunier Nut-Driving Machine

For use in driving or removing nuts, the Procunier Safety Chuck Company, 18 South Clinton St., Chicago, Ill., has developed the machine illustrated, which consists of a Procunier bench tapping machine mounted upon a table equipped with a special socket wrench and a safety friction clutch. The bench tapping machine was described on page 855, Vol. 58, of the *American Machinist*. The machine is driven by a chain from an electric motor.

When the nut is driven home, the friction of the chuck is overcome by the resistance of the lug on the chuck head. Protection against damage to the machine, should the friction become too high, is afforded by an elec-



Procunier Nut-Driving Machine

trical overload switch which safeguards against any possible damage to the motor. Should the switch operate and the machine stop, the latter can easily be restarted.

The machine illustrated was designed for handling large U-bolts. These are laid across the rack-bars on the table, thus bringing the nuts into a convenient position for the socket wrench. When it is desired to back off a nut, the direction of rotation of the spindle is reversed by merely tripping the foot treadle to engage the reverse clutch of the tapping machine. A nut backed-off in this manner drops through the hopper into a container placed upon the floor.

Staynew Pipe Line and Panel Air Filters

Two types of filters have been announced by the Staynew Filter Corporation, Rochester, N. Y. The first is an air filter that will remove dust, water, oil, rust, scale and other foreign matter from air passing through pipes. The second is a standard panel filter unit for use in filtering large volumes of air for building ventilation, turbo-generators and blowers.

The air filter for pipe lines consists of aluminum housing inclosed in a pressed-steel housing designed to withstand a working pressure of 125 lb. per sq.in. The device is shown in Fig. 1. The filter mounted inside consists of a felt filtering medium formed in pockets over radial, wire-screen fins grouped around a central outlet. This construction permits a relatively large area of felt to be placed in a compact space, and allows the use of the entire available area of felt with small restriction. The inserts are designed to pass 250 cu.ft. of free air per min. and contain 20 sq.ft. of felt within a volume less than 1 cu.ft. As the air enters the top of these filters it is thrown against the inner wall of the steel housing by a shield over the top of the filter. The downward velocity carries the water, oil, and grit to the bottom of the shell. All remaining impurities are caught by the filter. A drain cock is provided as shown at the bottom to remove water, oil and sediment. By opening the drain cock, the air in the outlet pipes or hose is blown back through the filter proper, thus removing all material on the filter surfaces. This cleaning operation requires about 10 min. and is necessary about twice a year. Under ordinary conditions, the filters do not have to be removed when once in operation.

The panel filters are supported in heavy pressed-steel frames, as shown in Fig. 2, which may be mounted in any convenient formation to suit the space available. The panel consists of two pressed-steel or aluminum frames which support a series of hollow fins or pockets, sixty in number, formed of a special rust-proof wire cloth arranged in two rows. Each row of fins is covered with a single piece of special filter material of fine texture. The efficiency is 99.9 per cent by test and is not decreased by reason of dust or dirt collecting on the filtering medium. Under or-

Fig. 1—Staynew Pipe Line Filter having a capacity of 250 cu.ft. per minute

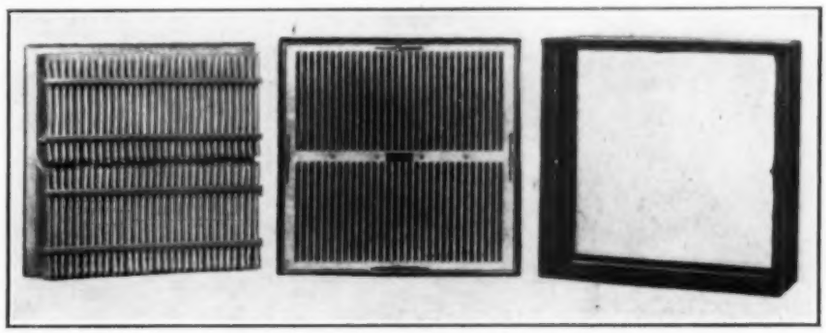


Fig. 2—Staynew Panel Filter Unit and Casing

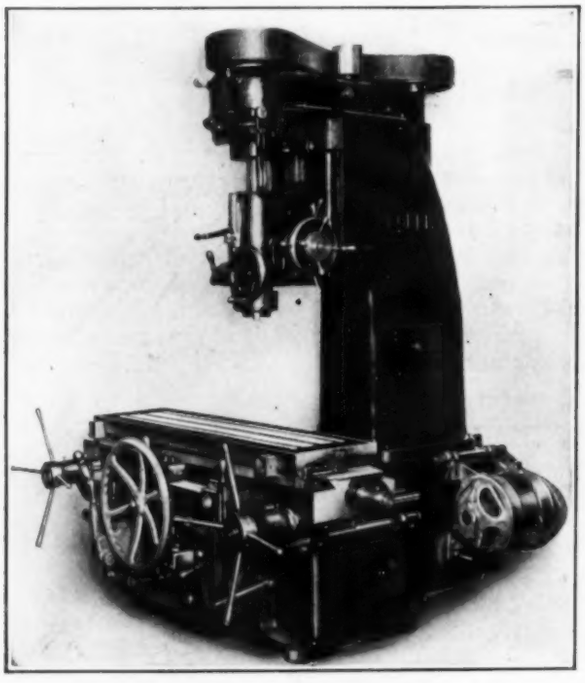
dinary conditions the filter operates for several months before requiring attention. Cleaning is done by means of a special high-suction cleaner by passing a special nozzle over the face of the panel where the openings into the pockets are located. This cleaning may be done without removing the panels from the frames.

The size of the filter and frame is 20x20x6⅝ in. and the size of the filter panel is 19½x19½x6⅜ in. The capacity of the filter unit is 800 cu.ft. per min., and the surface of the filtering medium is 45 sq.ft. The linear velocity of air through the filter medium is 18 ft. per min. while the resistance to the flow of air is ¼ in., water gage. Weight of the filter panel in aluminum is 18 lb. and the weight of the filter panel and frame in aluminum is 25 pounds.

Reed-Prentice No. 5 Die Sinker and Vertical Milling Machine

STURDY construction is provided in the No. 5 die sinker and vertical milling machine which has been announced by the Reed-Prentice Corporation, Worcester, Mass. This machine was developed to meet the demand for a precision high-speed machine. It is suitable for the vertical milling of large and heavy castings, the machining of drop forgings and body dies and similar work.

Many interesting features can be found in this machine. All the bearings, and there are over 70 of them in the speed, feed and top gear boxes, are of the roller type. The spindle is provided with a micrometer stop which accurately controls the depth of the cut. A wide range of spindle feeds and speeds is provided. In order to secure rigidity the base is made of a solid casting, and is provided with an adjustable head and spindle quill. All speed and control levers are located at the front of the machine in order to facilitate control. Wide range with rapid power traverse to either longitudinal or cross feeds in either direction is another feature. The high spindle speeds, which are desirable in the use of end mills and die sinking cutters, are secured through a belt drive to the spindle. One lever at the front of the machine controls both the main drive-pulley clutch and a brake for starting and stopping. Other features include heat-treated speed and feed gears of alloy steel running in oil, longitudinal and cross feed screws of heat-treated chrome-molybdenum steel, threads finished by lapping and nuts of special phosphor-bronze. The screws are run in roller bearings. A spindle of heat-treated, forged nickel-chromium steel is supplied with clutch-type nose and taper hole as adopted by the National Machine Tool Builders Association with a No. 12 B & S adapter. The counterweighted head and spindle provides for easy adjustment and large diameter handwheels are provided for the longitudinal feed.

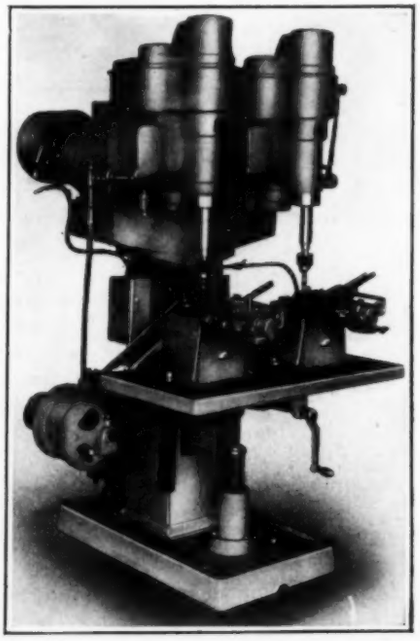


Reed-Prentice No. 5 Die Sinker and Vertical Milling Machine

This machine is regularly supplied with either single-pulley belt drive or direct-connected motor drive.

Gatermen Double-Spindle Pneumatic Tapper

Automatic feeding and ejecting devices for tapping nuts have been applied to the No. 10 S double-spindle, heavy-duty pneumatic tapping machine which has been introduced by the W. Gaterman Manufacturing Company, Manitowoc, Wis. The machine shown has many features in common with the No. 10 tapper, which was described on page 639, Vol. 67, of the *American Machinist*.

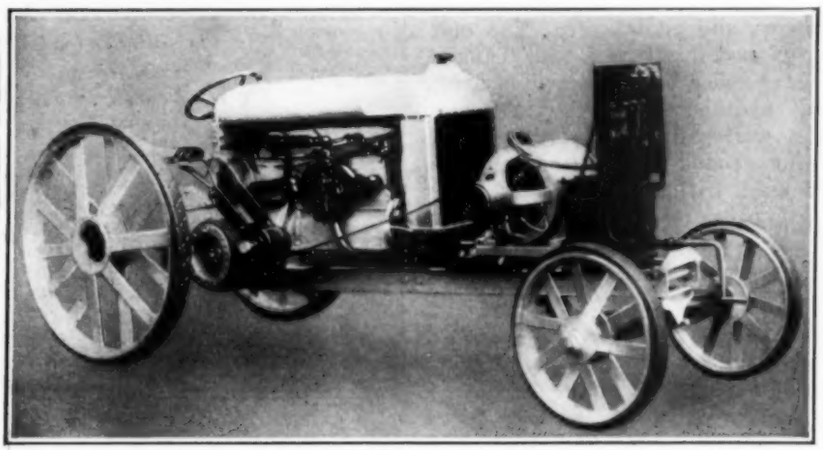


Gaterman No. 10 S Double-Spindle Pneumatic Tapper

The machine will tap 1,500 ¾-in. and 2,200 ½-in. U. S. standard nuts per hour. The weight of the machine is 3,600 pounds.

Pontiac-Lincoln Arc Welder

A new mounting of the standard Lincoln "Stable Arc" Welder has been announced by the Pontiac Tractor Company, Pontiac, Mich. The welder unit with stabilizer and panel



Pontiac-Lincoln Arc Welder

is mounted on a frame which attaches to either the McCormick-Deering 10/20 or Fordson tractor. This mounting of the arc welder gives a four-wheel, rubber-tired, self-propelled unit, capable of hauling heavy loads. This unit can also be mounted on crawlers for soft ground work.

Power is taken from the tractor, to drive the welder, through the power take-off pulley, which has a clutch allowing it to be thrown out of or into gear at will. The drive is so arranged that the belt tightener is brought into correct relation with the belt. These welders have proven successful on pipe line construction and steel fabrication.

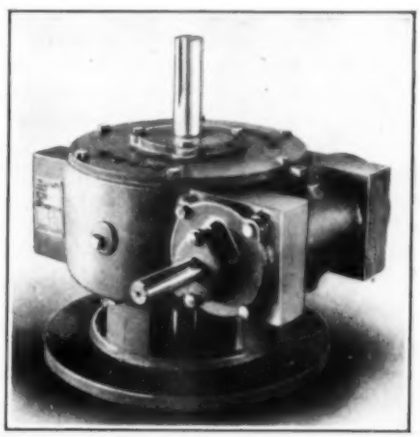
Cleveland Exhaust System for Plating Tank Fumes

REMOVAL of fumes from plating tanks can be effected by an exhaust system now being manufactured and installed by the Cleveland Blow Pipe and Manufacturing Company, Cleveland, Ohio. As shown in the illustration, a sheet-metal duct surrounds the top of the tank. Around the side facing the liquid, a narrow slot is cut. A certain volume of air is drawn through this slot at a definite high velocity, depending upon the size of the tank, and the "suction blanket" thus formed over the tank prevents any of the fumes from entering the room. The operator is therefore completely protected and, since the top of the tank is entirely unobstructed by overhead exhaust hoods, his work is not interfered with.

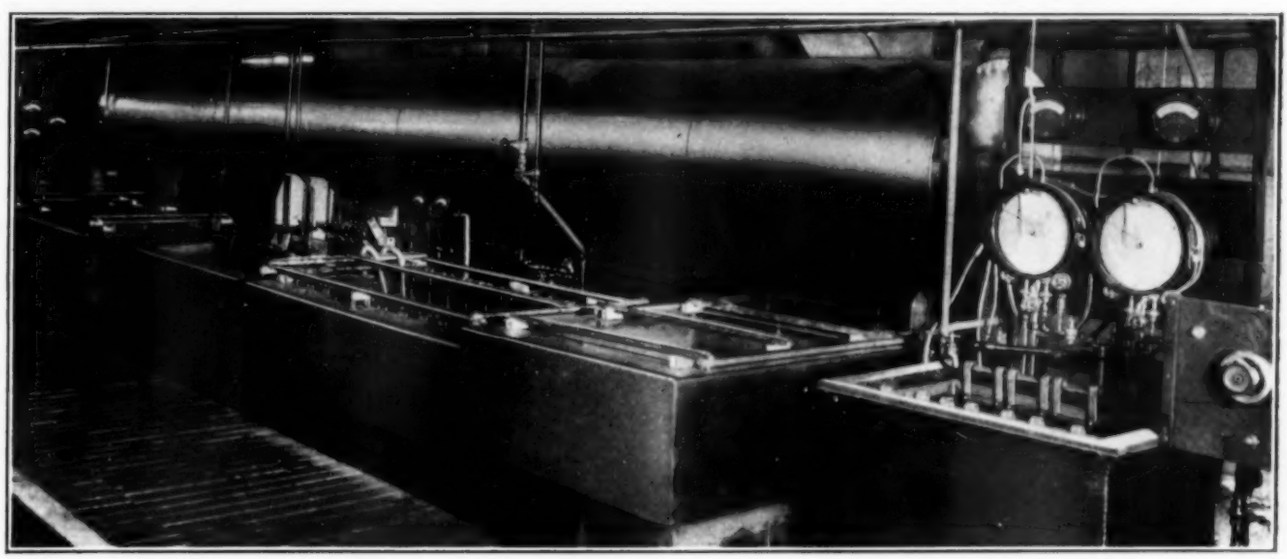
Fumes from chromium plating tanks are particularly dangerous to the operator, since they rapidly destroy the tissues of the lungs and produce a severe irritation in the membranes of the nose. Obviously complete removal is essential.

Boston Type V Vertical Speed Reducers

Slow speeds of vertical shafts can be obtained by the use of this Type V vertical speed reducer which has been brought out by the Boston



Boston Type V Vertical Speed Reducer



Cleveland Exhaust System for Plating Tank Fumes

Gear Works Sales Company, Norfolk Downs, Mass. These reducers can be easily fastened on the top of a machine, to the wall, or to the floor.

The Type V speed reducer, shown in the illustration, is designed so that the driven shaft can project above or below the device, or both, since a special oil-tight construction prevents any oil leakage. The unit is equipped throughout with Timken tapered roller bearings, and is fitted with phosphor-bronze worm gears. Steel worms that are hardened and having ground and polished threads are used. It is claimed that these speed reducers will not fail under reasonable overloads.

Illinois Universal Hob and Worm Testing Machine

ACCURATE testing of all the important elements in hobs and worms can be accomplished on the universal testing machine announced by the Illinois Tool Works, 2501 N. Keeler Ave., Chicago, Ill. This machine is intended for work up to 15 in. in diameter and 30 in. in length but will swing objects of special shapes whose weight is not in proportion to the bulk up to 20 in. in diameter and 40 in. between centers. In Fig. 1 there is shown a front view of the complete machine, which consists of a bed, a headstock with spindle, tailstock, carriage, lead screw and change gears to interconnect the spindle and the lead screw. On the carriage is a universal testing head which, in this view, is set in a horizontal position as used for testing either pressure angle or contour of a straight gashed hob, or of the axial inclination of the sides of the thread of a worm.

The machine is arranged to test the lead, the pressure angle, and the contour of the teeth in both straight- and helically-fluted hobs, and of corresponding parts of worm threads. It will also test the concentricity of the relief clearance of the hob teeth, and the spacing of threads or starts in multiple-threaded hobs and worms.

In making a lead test, the proper gears for the required lead are placed on the respective shafts and studs and adjusted to mesh freely. The work is placed between the centers to be driven by the head spindle, the contactor of the testing head is brought forward to engage the work at a desired depth, usually at the pitch line, and the indicator is adjusted to point to zero. A handwheel mounted in a bracket, slidable to a convenient position on the bed, is used for operating the machine. This handwheel is geared to a transmission shaft by a worm and worm gear and the shaft is geared to the lead screws by spur gears. Free turning of the worm gear is permitted when the clutch is released. A handwheel directly connected on the end of the lead screw has been provided for quickly returning the carriage to the starting position.

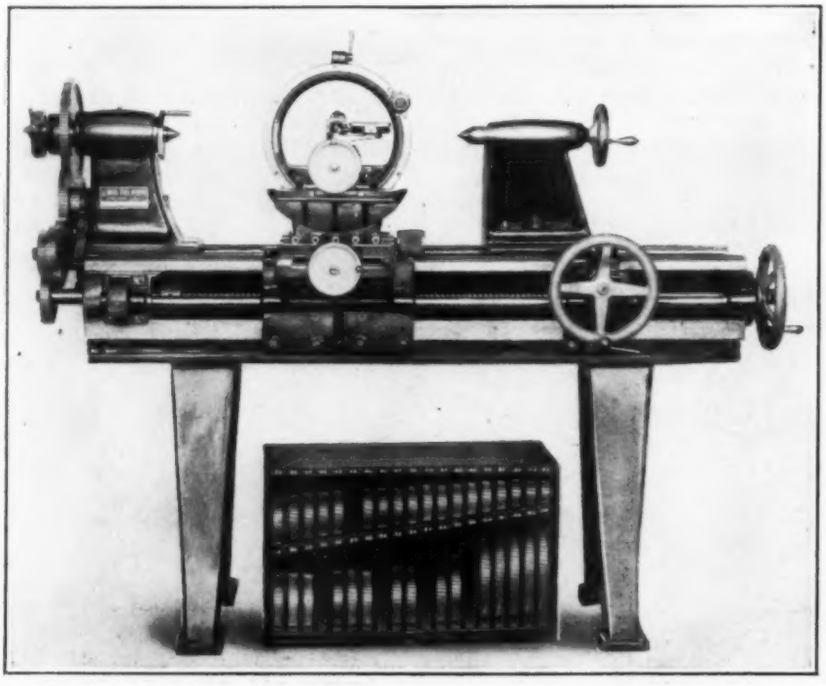


Fig. 1—Illinois Universal Hob and Worm Testing Machine

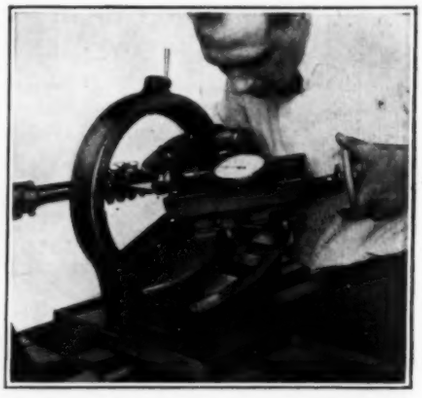


Fig. 2—Showing the operation of testing the pressure angles and profiles of the threads or teeth of a multiple-threaded worm or worm gear hob

The profile of a left-hand hob or worm thread having a 45-deg. helix angle and a 30-deg. pressure angle can be tested quite simply. The testing head is adjusted to the helix angle by the use of the knurled knob shown in Fig. 2 on the right-hand upper quarter of the vertical swivel-ring housing, to a graduated vernier scale positioned on the left side of the swivel ring. The swivel ring is held in position by a clamp screw on the top, at which point the housing is split.

A table, of which one end is rigidly fastened to the swivel ring, the other end being supported by a segment concentric to the swivel ring, supports the testing unit, consisting of a base, which is angularly adjustable on the table, a slide on the base, and a reversible test indicator. This base may be set to any angle on the table up to 30 deg. by the use of a sine bar and a button. For setting to the common angles of 14½, 20 and 30 deg., positive stops in the form of plug and bushings have been provided,

which may be seen in Fig. 2. Bolts are provided to rigidly fasten the base onto the table in any predetermined angular position. In Fig. 2 the operation of testing the pressure angles and profiles of the threads or teeth of a multiple-threaded worm or worm gear hob is shown.

The bed, headstock, tailstock and carriage are made of cast iron which has been thoroughly seasoned by repeated annealings between operations and finally scraped on mating surfaces. Nearly all of the steel parts are hardened and ground. A set of change gears is provided to cover the lead of common pitches and gear hobs. Other gears to give any lead can be furnished on specifications. The weight is 2,300 pounds.

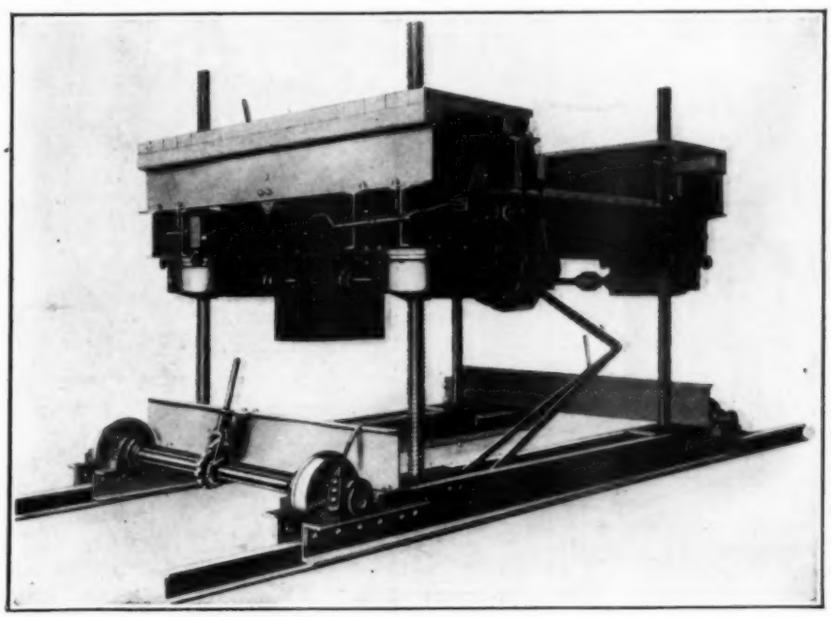
"Wasco" Four-Screw Electric Drop Pit Table

ELECTRIC operation is the feature of the drop pit table which has been announced by the Watson-Stillman Company, 75 West St., New York, N. Y. This table has a four-point-supported top operated by four self-locking worm drives always under control of the operator, so that it cannot drop or move without the application of power. Furthermore, the operator may work around or on the table top when it is at rest or in motion without danger. The detachable table top shown in the illustration may be obtained in sizes from 5 ft. 6 in. to 11 ft. 10 in. in length, measured parallel with the engine tracks. Tops are 10 ft. 6 in. wide with screws spaced 8 ft. 6 in. across to permit clearance for dropping trucks with outside journal boxes. Other lengths and widths can be furnished to suit specifications.

The top consists of standard materials and shapes securely bolted and riveted together as a unit. That part to which the rails are fastened consists of built-up girders in each end of which move locking bolts guided by castings. Locking bolts lock or unlock the top by means of levers operative from either side of the table top. The shoulders of the top have heavy oak flooring and the pit, about 18 in. deep as a standard, has matched flooring. The top is designed to carry a live or dead load with the maximum axle loading under normal or engine house practice.

The table consists of a structural steel superstructure to which the electrical controls and motor are fastened. All electrical equipment is waterproof. The drive from the motor is through cut spur gears to a shaft extending to both sides of the table. Hardened steel bevel gears incased and running in a bath of oil transmit power to each corner of the table. A shaft coupling transmits power to a worm equipped with a ball thrust bearing and a wormwheel backed up with a roller thrust bearing, which in turn revolves a bronze nut of ample proportions about a steel screw. All worms, wormwheels and nuts are incased and run in an oil bath. The screws are rigidly held in castings in the truck and are proportioned to withstand the rated load with a low thread pressure. They are entirely free from harmful sway. All bearings are bronze with Alemite fittings for greasing. The table is normally traversed by a manually-operated ratchet. Electric power traversing can be furnished.

Normally, tables are built of 50-ton capacity with a factor of safety of not less than five in any part. The tables are built to raise the tops 4 in. higher than the track. This can be accomplished without unlocking the top as table is equipped with an upper limit switch to prevent overtravel.



"Wasco" Four-Screw Electric Drop Pit Table

Full Electric Operation

The Wasco table is fully electrically operated. Control of the motor is effected by a pendant push-button station which may be carried to the work.

To lower a top it is necessary to bring the table underneath, raise it from $\frac{1}{8}$ to $\frac{1}{2}$ in. in order to release the locking bolts, which are notched to prevent careless unlocking of the top when the table is not in position. An electric limit switch is brought into play when the table comes up under a top thus making it necessary to completely unlock or lock the top before lowering of the table can be accomplished.

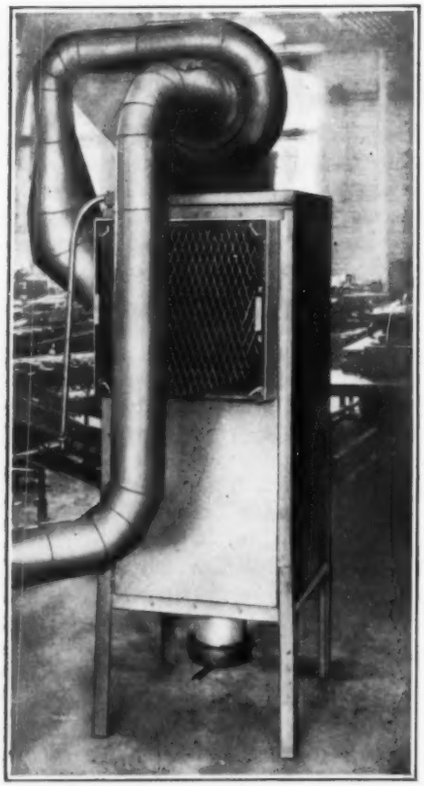
When movement through a restricted zone is desired, a "working zone" is set to suit individual requirements. As soon as the table passes out of the working zone, an automatic control comes into play and the table will move in the direction started until it hits a limit switch. The table may be stopped in any position when under automatic control.

The normal vertical movement of the Wasco table is 12 in. It is sometimes advantageous to use a two-speed table which can be furnished. Where two speeds are used, the slow

speed of 12 in. per min. prevails in the working zone, and the high speed of 24 in. per min. below this zone. The change from one speed to the other is automatic.

Midwest Air Filters Adapted to Grinding Machines

Air discharged from grinding machines may be cleaned by the Type U-2 air filter manufactured by Midwest Air Filters, Inc., Bradford, Pa. As shown in the illustration, the filter is incorporated in a dust-collecting



Midwest Type U-2 Air Filter applied to removing and filtering dust-laden air from grinding machines

cabinet having a centrifugal fan mounted thereon and sucking the dust-laden air from either the individual machine or small batteries.

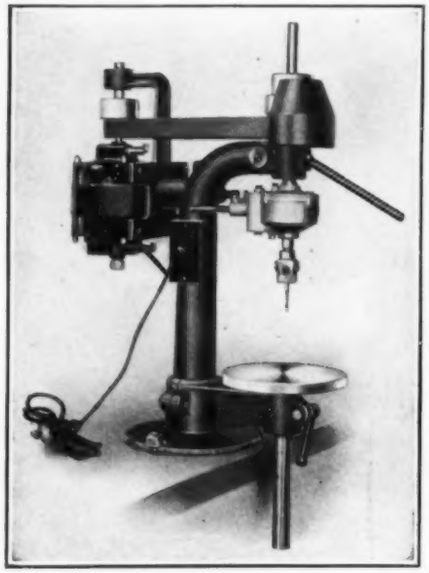
The advantages claimed for the equipment are: Since the machine is mounted indoors, recirculation of air effects economies in heating; low cost of installation, due to compact arrangement and short run of ducts; indestructible filtering medium permits long service; low operating expense due to low suction required; high dust capacity, about 8 lb. ordinarily; and the filters can be washed.

The size of the filter installation depends upon the number of grinding wheels and the suction pressure. For light grinding work, a 9-unit filter will handle from 15 to 20 small grinding wheels, maintain a 3-in. water gage suction at the wheels and remove dust-laden air at a velocity of 300 to 350 ft. per min. For heavy grinding operations the air velocity will be about 200 ft. per minute.

"Ettco" Vertical Tapping Attachment Applied to "C-O" Drill Press

This motor-driven tapping machine, consisting of an "Ettco" vertical tapping attachment applied to a special "C-O" ball-bearing drill press, has been announced by the Eastern Tube and Tool Company, 594 Johnson Ave., Brooklyn, N. Y. The drill press is adapted from the C-O drill press made by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill., and described on page 521, Vol. 67, of the *American Machinist*. A No. 1 Ettco tapper having a capacity for tapping holes up to $\frac{1}{4}$ in. in diameter is provided. This attachment was described on page 941, Vol. 56, of the *American Machinist*.

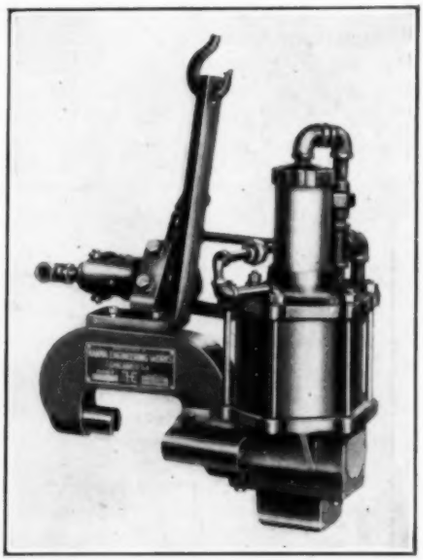
Proper tension of the belt is obtained by the manner in which the motor is attached to the drill press. The spindle speeds are 850 and 1,400 r.p.m. The pulleys are balanced for high speed and the spindle is accurately ground and equipped with ball thrust and radial bearings, which are accurately fitted to insure true running of the tapper. A round table 8 in. in diameter is provided to hold the work. The vertical movement of the spindle is $2\frac{1}{2}$ in. and that of the table is 7 in. The greatest distance between the tap chuck and the table is 6 in. The height of the entire machine is $22\frac{3}{4}$ in. This tapping machine may be obtained for 110 and 220 d.c. or a.c. circuits. The latter must be single phase at 60 cycles. Net weight of the machine is 78 pounds.



"Ettco" Vertical Tapping Attachment Applied to "C-O" Drill Press

Hanna Portable, Pneumatic Shackle-Pin Press

A portable pneumatic press exerting 8 tons pressure and weighing only 95 lb. is being offered by the Hanna Engineering Works 1765 Elston Ave., Chicago, Ill. The press illustrated has 2 in. depth of throat,



Hanna Portable, Pneumatic Shackle-Pin Press

a 6-in. gap and a $\frac{5}{8}$-in. die stroke. Several sizes are available.

This press is particularly adapted to pressing shackle pins into automobile chassis frames as the frames pass along a chassis assembly conveyor line. The pressure exerted

and the short stroke adapt it to shackle pins that are serrated under the head and have a threaded hole in the head which must not be marred.

The mechanism between the air piston and die is of the roller and wedge type, which provides a variable leverage or tonnage to conform to the work to be done. This feature in combination with the low friction of the mechanism results in low air consumption.

"Loadmaster" Swing-Crane

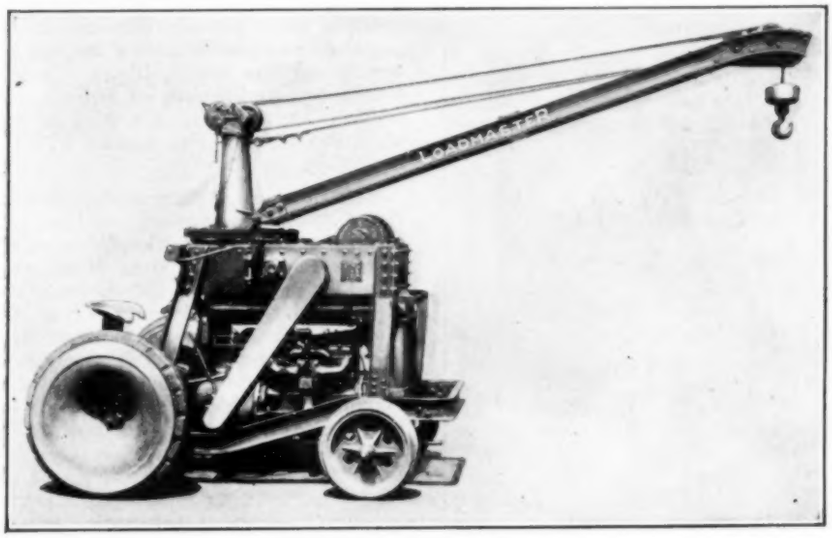
A MOVABLE power-driven crane unit, known as the "Loadmaster" swing-crane, has been announced by Frederic H. Poor, Inc., 50 Church St., New York, N. Y. When the tractor is stationary, the swinging crane can handle loads over a radius of 10 ft. from the mast center. All operations, such as traction, boom swing, and boom lift are performed by power from the tractor engine, and all controls are within reach of a single operator.

In designing the Loadmaster swing-crane, consideration has been given to providing stability and sturdiness in a movable unit. To this end, specially weighted wheels are employed at both rear and front to counterbalance loads in suspension from the boom; and broad tires upon these wheels sustain the loads without undue loading.

The frame, upon which the mast is located, consists of a fabricated plate and channel structure secured at the rear to the axle-housing of the tractor, and is suspended at the front in such a way as to compensate for irregularities in the floor or roadbed over which the machine travels.

The hoisting drum is directly connected to a self-locking worm gear, and is operated from the power shaft through a clutch and bevel pinions by a control lever placed within easy reach of the operator. When the drum is not in motion the self-locking worm gear holds the load in suspended on the boom.

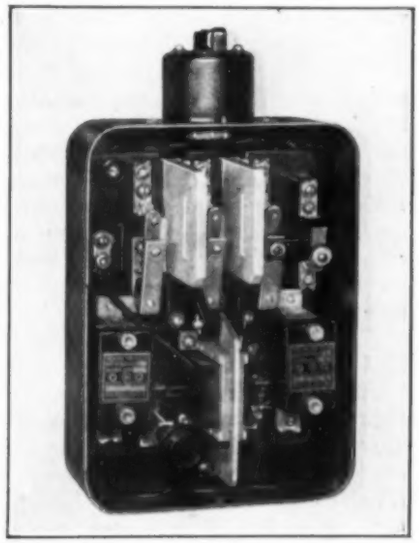
The swinging boom is constructed of two steel channels firmly braced together, and equipped with necessary sheaves and hook weight. The "bull wheel" by which the boom is swung about the mast, is power driven by means of a chain and sprocket, and is equipped with an expanding brake of such design that the boom can be controlled in its swing, or, when not under power, be set in any fixed position. Maximum loads can be lifted at short outreaches, as is usual with all swing cranes. It will be seen in the illustration that the lifting capacity is greatest with the boom directly forward. The full swing arc of the boom under load is approximately 240 deg., 120 deg. on either side of the forward position. Adjustable telescoping outriggers, allowing heavier loads to be swung over the sides, can be furnished.



"Loadmaster" Swing-Crane

General Electric Control Switches

For application where it is desirable to control a magnetic starter at the switch itself, the General Electric Company, Schenectady, N. Y., has designed two small control switches. These may be mounted in the knockouts of the inclosing case of any



General Electric Control Switch inserted in a knockout of a magnetic starter

starter as shown, and are held rigidly in place by a conduit bushing which forms part of the switch.

One control switch, bearing the designation SY-103-A, is of the maintaining-contact type whose action is similar to a single-pole, double-throw switch. It is provided with three positions, "Hand," "Off," and "Automatic." This switch can be applied to refrigerating machines controlled by thermostats, and also where float switches and pressure governors are used in the same manner as a thermostat. When the operating lever of this switch is in the "Automatic" position, the thermostat, float switch or governor, controls the machine. On the "Hand" position, the machine runs continuously.

The second device bears the designation SY-194-A and is a two-position, momentary-contact switch provided with the positions "Start" and "Stop." This is the equivalent of the usual push-button station of the same marking. It is applicable to situations necessitating the starting

and stopping of the motor at the magnetic switch.

Both switches are equipped with leads ready for wiring and have sufficient capacity to handle magnetic starters up to 75-amp. capacity. They can be used on 600-volt circuits with safety to the operator.

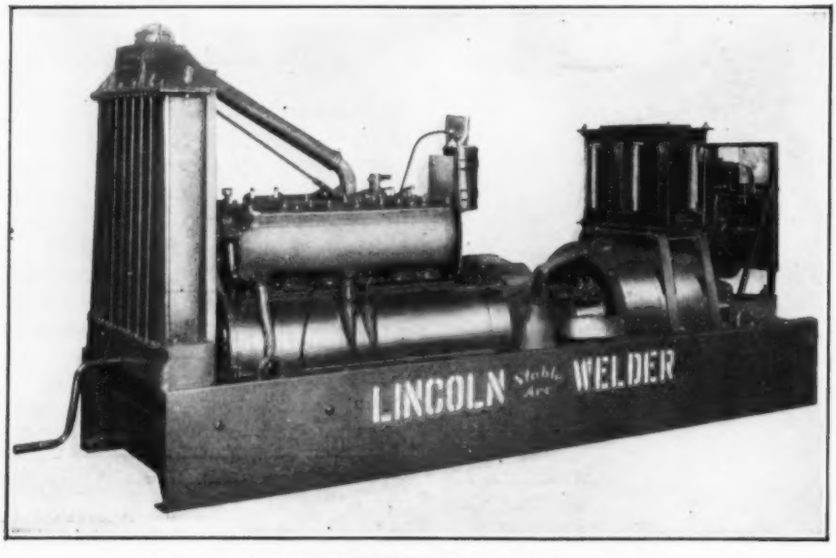
Lincoln Model S-1964 Gas-Engine-Driven Welder

A GAS-ENGINE-DRIVEN welder, known as Model S-1964, has been announced by the Lincoln Electric Company, Cleveland, Ohio. The welding generator is rated at 300 amp. in accordance with the N.E.M.A. standards and has a current range of from 75 to 400 amp. for metallic-electrode welding. It is driven at 1,500 r.p.m. by a direct-connected model HS-6 Buda engine having six cylinders. Both units are mounted on a welded steel base, thus giving them strength and rigidity.

The engine has an S.A.E. rating of 27.3 hp. and gives 41 brake hp. while running at the operating speed. Economical gasoline consumption is a feature of the engine. The gas tank is located in the channel iron frame under the engine, thus eliminating fire hazard.

The generator has the laminated magnetic circuit with separately-excited field, stabilizer, variable voltage and steel constructional features characteristic of the manufacturer's line of "Stable-Arc" welders. The overall dimensions of the welder are 93 in. long, 35 in. wide and 45 in. high.

The equipment has been designed to meet the constantly increasing use of larger electrodes in welding. The six cylinder engine gives a smooth, even flow of power necessary for successful welding.



Lincoln Model S-1964 Gas-Engine-Driven Welder

Trade Catalogs

CHAIN HOISTS. The Union Manufacturing Co., New Britain, Conn., has published a leaflet showing the features of its line of chain hoists equipped with roller bearings. These hoists are made in twelve sizes, from 1 to 20 hp. Hoists of other types are also shown.

CHUCKS. The Union Manufacturing Co., New Britain, Conn., has published Catalog No. 60, showing manually-operated chucks for all classes of work and every type of machine tool. Complete dimensional data has been given, and many new chucks are shown. In addition, its line of chain hoists is shown. The catalog contains 64 7½x5-in. pages.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has published a series of catalogs on several types of equipment. Catalog 166A describes MTC and MQC a.c. crane and hoist motors. Bulletin 403A shows type CR 3900 drum-type switches for throwing small a.c. or d.c. motors across the line. Catalog 753A shows type CR 9516 shoe-type solenoid brakes for a.c. and d.c. motors. Bulletin 832 describes portable oil testing sets. Catalog 941 shows type CP motor-driven center-gear reciprocating air compressor for railway and industrial service. Bulletin 972 describes pot-type electric furnaces for cyanide hardening. Catalog 973 shows type CR 3100 drum controllers for series-, shunt-, or compound-wound d.c. motors. All of these bulletins are illustrated by means of photographs. In many cases, tables of data are presented.

LUBRICATORS. The Madison-Kipp Corporation, Madison, Wis., has reprinted a group of recent advertisements showing the application of its lubricators to many types of equipment. The catalog is well printed and contains 56 14x10½-in. pages.

TRANSMISSION AND CONVEYING EQUIPMENT. The Link-Belt Co., Chicago, Ill., has published General Catalog No. 500, which is a 1,088-page book containing engineering data and list prices of the complete chain, sprocket, power transmission, elevating and conveying and engineering divisions of the company's business. Furthermore, it contains general engineering data. In addition to being an unusual engineering catalog, it is a text book of the conveying, elevating, and chain transmission art.

Pamphlets Received

AUTOMOBILE INDUSTRY FACTS. This tenth annual edition of the facts and figures of the automobile industry has been prepared for 1928, by the National Automobile Chamber of Commerce, New York City. It contains the tabulations of the major automobile markets, methods of taxation in different states, gasoline consumption by states, transcontinental bus routes, highway grade separations, and figures on metropolitan traffic. Many charts are used to explain the tables. The booklet contains 96 9x6-in. pages.

RESEARCH IN ADVERTISING. Report No. 4 on applying research to sales is a study of better business through research in New England industries. It was prepared for the Research Committee of the New England Council, by the Policy Holders' Service Bureau, of the Metropolitan Life Insurance Company, New York City. The study shows that "blind" advertising is rare among progressive New England concerns. The use of research is discussed in the selection of mediums, the planning of an effective appeal, the securing of material for copy and the measuring of results. Experiences of various manufacturers are cited.

NEWS OF THE WEEK

A.R.A. Holds Ninth Meeting and Fifth Exhibit

Motor buses given space for first time

THERE were two notable differences between former exhibitions and this year's biennial exhibition held in connection with the ninth annual meeting of the American Railway Association, Mechanical Division, at Atlantic City, June 20 to 27. These differences were the absence of nearly all machine tool exhibits and the use of additional exhibition space, known as Marine Hall, adjoining the main pier on the ocean side of boardwalk, to accommodate machine exhibits. This feature was in marked contrast to the separate building for machinery exhibits.

The few machines exhibited were for the most part of types built especially for railroad shop use. No large machine tools were shown, the builders of machines of this class being content to show photographs only, or to have booths only, when represented.

Small tools and appliances such as cutters, portable grinders, pneumatic tools, hoists and the like were well represented with ample space in most cases to show the lines fully and interestingly.

Railway appliances were well represented, the space given to motor buses indicating the extent to which railways are realizing that it is their function to furnish transportation which need not be confined to conveyances running on steel rails. The coming of air transport as an adjunct to railways was presaged by the exhibit of a "Wasp" airplane motor.

Technical Sessions

Technical sessions were held by both the Mechanical Division and the Purchases and Stores Division, the latter confining its meetings to the days from the 20th to the 22nd inclusive. Of particular interest to the machinery industries was the report on "Design of Shops and Engine Terminals," presented by W. A. Callison, chairman of the committee dealing with that subject.

G. E. Smart, chief of car equipment, Canadian National, was nominated for the office of chairman for the term expiring June, 1930. A. R. Ayres, general manager, New York, Chicago & St. Louis, was nominated for vice-chairman. Seven members were nominated to serve on the general committee. They were C. E. Chambers, superintendent motive power and equipment, Central Railroad of New Jersey; C. J. Bodemer, acting superintendent of machinery, Louisville & Nashville; E. B. Hall, superintendent of motive power, Chicago & Northwestern; J. E. O'Brien, chief of motive power and equipment, Seaboard Air Line; John Purcell, assistant to vice-president, Atchison, Topeka & Santa Fe; R. L. Kleine, assistant chief of motive power, Pennsylvania; and O. A. Garber, chief mechanical engineer, Missouri Pacific. W. L. Bean, mechanical manager, New York, New Haven & Hartford, was nominated to fill the vacancy created by the nomination of A. R. Ayres to the office of vice-chairman.

Among the exhibitors showing machine tools, small tools, and other shop equipment, were the following:

List of Exhibitors

Air Reduction Sales Co., New York; American Car and Foundry Co., New York; American Optical Co., Southbridge, Mass.; E. C. Atkins & Co., Indianapolis, Ind.; Automatic Nut Thread Corporation, Philadelphia, Pa.

Baker-Raulang Co., Cleveland, Ohio; Bassick Manufacturing Co., Chicago; Bicknell-Thomas Co., Greenfield, Mass.; Black & Decker Manufacturing Co., Towson, Md.; S. F. Bowser & Co., Inc., Fort Wayne, Ind.; C. C. Bradley & Son, Inc., Syracuse, N. Y.; W. L. Brubaker & Bros. Co., Millersburg, Pa.; Buckeye Portable Tool Co., Dayton, Ohio; Buffalo Forge Co., Buffalo, N. Y.

Chicago Pneumatic Tool Co., New York; Chisholm-Moore Manufacturing Co., Cleveland, Ohio; Clark Tructractor Co., Battle Creek, Mich.; Cleveland Pneumatic Tool Co., Cleveland, Ohio; Cleveland Twist Drill Co., Cleveland, Ohio; Consolidated Machine Tool Corporation, Rochester, N. Y.; Crowe Manufacturing Co., Cincinnati, Ohio..

Delta File Works, Philadelphia, Pa.; Henry Disston & Sons, Inc., Philadelphia, Pa.

Elwell-Parker Electric Co., New York.

Foley Saw Tool Co., Inc., Minneapolis, Minn.; J. B. Ford Co., Wyandotte, Mich.

Gairing Tool Co., Detroit, Mich.; General Electric Co., Schenectady, N. Y.

Hertzler & Zook Co., Belleville, Pa.; Hisey-Wolf Machine Co., Cincinnati, Ohio; E. F. Houghton & Co., Philadelphia, Pa.; Hutto Engineering Co., Inc., Detroit, Mich.; the Hyatt Roller Bearing Company, Newark, New Jersey.

Independent Pneumatic Tool Co., Chicago; Industrial Brownhoist Corporation, Cleveland, Ohio; Ingersoll-Rand Co., New York; International Nickel Co., Inc., New York.

Jones Machine Tool Works, Inc., Philadelphia, Pa.; Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

Kant-Rust Products Corporation, Rahway N. J.; K-G Welding & Cutting Co., Inc., New York; William H. Keller, Inc., Grand Haven, Mich.; Keystone Grinder & Manufacturing Co., Pittsburgh, Pa.

Landis Machine Co., Waynesboro, Pa.; Lehmann Machine Co., St. Louis, Mo.; Lewis-Shepard Co., Watertown, Mass.; Link-Belt Co., Chicago.

Madison-Kipp Corporation, Madison, Wis.; Metal & Thermit Corporation, New York; Micro Machine Co., Bettendorf, Iowa; Alexander Milburn Co., Baltimore, Md.; Monarch Products Co., Red Bank, N. J.; Morton Manufacturing Co., Muskegon Heights, Mich.

Niles-Bement-Pond Co., New York; R. D. Nuttall Co., Pittsburgh, Pa.

Oakite Products, Inc., New York; O. K. Tool Co., Inc., Shelton, Conn.

Peerless Machine Co., Racine, Wis.; Henry Pels & Co., Inc., New York; Pratt & Whitney Co., New York; Production Machine Co., Greenfield, Mass.

Quigley Furnace Specialties Co., Inc., New York.

Reading Chain & Block Corporation, Reading, Pa.; E. J. Rooksby & Co., Philadelphia, Pa.

SKF Industries, Inc., New York; Simonds Saw & Steel Co., Fitchburg, Mass., David H. Smith & Sons, Inc., Brooklyn, N. Y.; Special Bolt Machinery Corporation, New York; L. S. Starrett Co., Athol, Mass.; Sullivan Machinery Co., Chicago; Swind Machinery Co., Philadelphia, Pa.

Timken Roller Bearing Co., Canton, Ohio.

H. B. Underwood Corporation, Philadelphia, Pa.

Van Dorn Electric Tool Co., Cleveland, Ohio.

Watson-Stillman Co., New York; Western Tool & Manufacturing Co., Springfield, Ohio; Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.; Whiting Corporation, Harvey, Ill.; Wicaco Screw & Machine Works, Inc., Philadelphia, Pa.; Williams Tool Corporation, Erie, Pa.

Yale & Towne Manufacturing Co., Stamford, Conn.

Much rolling stock equipment was also shown.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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NOT so many years ago it was discovered that rheumatism and its kindred ailments were often due to dental abscesses that were invisible until the X-ray became an agent of medical science. Revealing as it did the complex interdependence of the physical organism that is called the body, this discovery was profoundly important and under its stimulus we are commencing to find many analogous relationships in the field of economics.

To the superficial observer it is, for instance, something of a surprise to learn that the price of tea in the United States is more or less dependent upon the output of the Russian wheat crop, and that road building in the West and South is likely to be held up because interest rates are higher.

But the relation between the price of tea and the Russian wheat harvest becomes obvious when it is explained that the Russians, who are great tea drinkers, buy less if their purchasing power is reduced by a poor wheat crop, and the connection between interest rates and road building is explained by the inability or unwillingness of small communities to sell road bonds when money is dear.

The number of such relationships is infinite, and their existence makes it impossible to interpret any one feature of the business situation without considering a myriad of other factors that have more or less influence. The difficulty of reaching a precise conclusion is further increased by the constantly changing psychology of the public. Happenings that would be regarded as auspicious when optimism prevails are unfavorably construed when pessimism is rampant, and allowance must always be made for the personal equation.

These observations are especially apposite at a time like the present when sentiment seems to be changing and the complexities of business are greatly increased by the introduction of the political elements as well as by the preoccupation of millions with the stock market. "Where your treasure is there will your heart be also" is a statement for which there is high authority, and with billions of borrowed capital and other billions of savings employed in carrying securities on margin, it is quite natural that the trend of Stock Exchange quotations should have a preponderant influence upon every phase of business.

Therefore it is entirely logical that Commerce should be marking time while it waits to see whether Finance will continue to retreat from the altitudes recently attained in the stock market. The average price of representative securities was somewhat lower at the end of last week than at the beginning, and if a referendum of conservative opinion could be taken it would probably be found that a majority expect a continuance of the recent liquidation with a further reduction in brokers' loans. Last week's decrease, as reported by the Federal Reserve Bank of New York, was $158,000,000, and while this connotes progress there is a feeling that a further contraction will be seen. This is probably due to the comparatively high rates paid for call money, which rose to 7 per cent on more than one day last week and have operated as a check rein to restrain the enthusiasm of quondam bulls.

But this is not to say that a precipitate decline in seasoned securities is any longer to be expected or feared. The liberal margins insisted upon by most brokers have made foreclosure sales unnecessary and what is called "the technical position" is sound. Therefore it seems unlikely that the shadow of the Stock Exchange boom will continue to obscure the business outlook, and from now on the trend of trade will probably be shaped by intrinsic rather than extrinsic considerations.

Granting this, it is gratifying to observe that a slight improvement is reported in some lines of business and that the automobile industry in particular is more active than usual at this season of the year.

Increased activity in the shoe trade and in lumber and building is also reported, but textiles, and especially cotton textiles, are still in a state of acute depression. The steel manufacturers are also complaining of the dullness in their industry, but they are a little less pessimistic than the cotton men as they predict an early revival and call attention to the fact that production is still running ahead of last year.

A slight improvement in the petroleum industry is also to be noted, but there seems to be no hope for coal unless some inventive genius shall find a way to utilize it in competition with oil and hydro-electric power. The staple food products show but little change

Coffee is also bought sparingly because the consumers think it is too high. Rubber has been quiet and commodity speculation in general has been restrained.

It is expected that the Houston Convention will provide much entertainment for those who are interested in politics, but this is no reason why its action should have any direct or immediate effect upon trade or finance, and after its adjournment there ought to be a hiatus of two or three months during which consumption should catch up with production and investors will have an opportunity to digest the undigested securities that have caused more or less financial flatulence.

WHAT'S DOING IN INDUSTRY

LITTLE change is noted in the machine tool market over that reported for last week. The depression in Detroit continues, due to the slowing up of orders from the automotive industry, with the exception of Ford. General business, however, is at a high level. Similarly the quietness in New England is still pronounced, but general industrial conditions are satisfactory, particularly in the southern part. Here also automotive buying of machine tools is declining.

IN NEW YORK optimism is still apparent, and for one representative dealer, at least, June is looked to as the best month this year, which has been by no means a dull one. The expected seasonal decline has failed to materialize and inquiries are holding up well, particularly from aeronautical engine companies. As predicted last week, the slight falling off in sales in Cincinnati was only temporary, and an improvement is now noted. For one builder, June has proved to have been the best month, and for dealers in general, business is better than usual, as many long-pending deals are now being closed. Inquiries are satisfactory as to volume and tone.

CONDITIONS in the South continue to hold a high average level, and no letup is expected during the summer. The textile industry as before holds first place in the machinery field. Woodworking machinery sales have dropped to normal, and the sale of road construction equipment is quieting down; garage equipment is quiet, and railroad tool orders are scattered. In Chicago, conditions are quite satisfactory. Business goes on apace in Canada, with large construction contracts the feature.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

INDIANAPOLIS

Little improvement is seen in the demand for machine tools or machinery in this territory. In fact the demand seems to become more spotted and the trade is entering the summer season with a somewhat dubious future. A decline during the season is expected by the trade, but because of the lateness of the spring and other conditions, it was not thought the decline would start so early.

The automobile demand for machine tools, which started out well early in the spring, has slumped radically. Most of the local factories are working on greatly decreased production, if at all, and other Indiana factories are offering but an indifferent demand. Nor are there any immediate signs of a resumption of operations.

A fair demand is reported for special machinery to be used in the oil fields. This demand is hardly as good as it should be, but weather conditions are reported to be against heavy production in many localities, and this doubtless is responsible for the present volume of business.

A little better prospect seems to be seen for sales of special machinery to lumber manufacturing plants. Weather conditions have been so wet during the spring that dry stocks are scarce and the lumber producing men of this state are behind with their operations. Some new machinery will be necessary to catch up production. With special wood working machinery the demand is about normal. If the furniture factories were in the market the volume would be good, but they are doing no purchasing. Demand from automobile body factories is good, however, and is keeping up the level.

Railroads are doing little buying, and little is expected now until later in the summer. The same is true of the interurbans of the state. Some special electric machinery is being purchased, however.

SOUTHERN DISTRICT

Southern machinery and machine tool distributors state there has been no important change in market conditions in the southern district the last two or three weeks, and that while business as a whole has a tendency to be quiet, volume compares favorably with the corresponding period last year and is about normal. With most of the dealers, sales during June have been on about the same level with the last half of May, and most dealers believe business during the summer months will continue on about the same basis, or may possibly show some decline. As a whole, the trade considers the fall outlook fairly good, and believes business for that period will be approximately normal.

Woodworking machinery sales, which were unusually active during the first four months of the year, have now quieted down to about a normal level, and will probably continue normal for the next few months. Sales to garages and smaller machine shops continue very quiet, with most new orders being for used or rebuilt machinery and hardly any orders reported for new equipment.

The textile industry is now near the front rank as an equipment buyer, due to the numerous large mill construction projects under way in the Southeast, and it is considered likely that this industry will continue the heaviest buyers during the summer. Scattered sales of machinery for road construction and general building are reported but this business has also quieted down with the approach of summer, though in larger cities where unusual building progress is being made this season some good sales of contractors' equipment are reported. A few scattered sales of heavy equipment to railroads are also reported.

CANADA

Continued improvement is noted in the metal working industry in Canada. Practically every branch of the industry is enjoying a higher degree of activity than at this time last year, and the outlook for the next three months at least is highly promising.

Conditions in the iron and steel market are particularly promising. Demand for steel from the building, hardware and machinery trades is stated to be in record volume. Competition from firms in other countries is very strong, but Canadian mills are getting a considerable share of the business.

Activity is pronounced in the agricultural implement, automotive and engineering lines, where large quantities of iron and steel are being consumed. The course of employment in the construction industries also shows that there has been a marked expansion since the beginning of the year. Manufacture of airplanes is keeping the Maisonneuve factory of Canadian Vickers, Ltd., busy. The company is now in extensive production, turning out two machines a week on an average. A new extension to the plant was recently started and this is rapidly nearing completion. Operations at the plant of the Hamilton Bridge Co. are reported at a rate which indicates the current year will show a considerable increase in earnings for the company. It is expected that this firm will secure the contract for the structural steel work for the huge new building to be erected in Toronto for the Canadian Bank of Commerce.

Construction contracts awarded throughout the Dominion during May exceeded all previous totals for any month in any year. The record figure of $70,684,100 was 25 per cent greater than that for April, and 51 per cent greater than for May, 1927.

NEW YORK

The same optimistic outlook that has characterized the New York machine tool market for past few months is still in evidence in the past week. While not everyone reported business good, it was obvious that much business is pending and that inquiries are holding up well. For one large dealer at least, it is predicted that the month of June will prove to be the best this year, which so far has been quite active. Sales of small machine tools have fallen off, but electric drills and grinders still find a good market. Grinding wheels are also selling well.

For the past month a steady flow of inquiries has been reported from the General Electric Co., and while everyone is expecting orders to materialize in the near future, only a few have actually been placed at this writing, June 22. These called for two Starret precision lathes and some American lathes. The same condition of expectancy prevails in the case of the Wright Aeronautical Corporation, long a buyer in small lots, and now looked to as a purchaser in some quantity.

Among other shops mentioned as being active in this area are: the International Motor Co., the Hyatt Roller Bearing Co., the Federal Bearings Co., the Fairchild Caminez Engine Co., and the L. C. Smith Manufacturing Co. Structural shops are said to be taking orders at a loss to keep equipment busy, or else refusing to take orders during a period of apparent cut-throat competition. Hence, equipment purchases are few and far between. Job shops are living from hand to mouth and have bought little in the way of machines or tools for some time. Railroad buying is still curtailed. Track tools and other forged railway tools for some time have found a slow market.

The Pratt & Whitney Co. reports a large volume of sales in the past week. The orders came from all parts of the country, the high light being an order from a telephone manufacturing company in the Middle West. In this order were eighteen 13-in. lathes. The company also sold five 16-in. lathes, five jig borers, one 6-in. vertical shaper, one die sinker to a forging company in Chicago, two surface grinders, one thread miller, four bench lathes and two bench millers. Machines sold through the Niles Tool Works Co. included three 3-ft. Morris radial drills, a No. 5 Newark gear cutter, a 32-in. Acme shaper, a 4-spindle nut tapper to the New York Central R.R., and an Ohio miller to a company in New York State.

DETROIT

There is a very definite depression in the Detroit machinery and machine tool market, due almost entirely, it is believed, to the annual summer slowing-up of the motor industry.

Very few orders are being placed, and almost no inquiries are coming in. Many of the automobile factories are closing for vacations, and the others are running slowly. Ford is still doing some buying, however, and is still letting out a great deal of work to the small shops.

Most of the dealers are taking advantage of this let-up to catch up on their back work, and to bring their deliveries up to date. The others are taking their vacations.

General business conditions here are very good, and people seem to have plenty of money to spend. The general prosperity has been high for the past six months, and apparently is still high.

It is expected that there will be no great action in the machinery market for at least two months. There are indications that a number of automotive plants will come into the market again in the fall for considerable equipment. The year as a whole will probably be better than any of the past few years.

CINCINNATI

The great majority of the machine tool manufacturers in the Cincinnati district report that in the past week the market improved and an increased volume of business was booked. "So far, this has been the best month of the year, and inquiries coming in indicate that the prospects are good," stated one manufacturer. "Business has been very good the past week, partly due, I think, to the fact that many users are sending in orders for their needs in advance of going on a vacation," stated another. A small number of manufacturers reported that with them the week was somewhat dull, but these are an exception.

Selling agents report an increase in business in the week. "Business is better than

is usual at this time of the year," said one. "We have been able to close orders with less delay than has been usual, in case of new inquiries, and we are closing many deals that have been pending for some time."

The feature of the week's business was the sale of a well diversified line of single tools. The buying done by railroads and automobile manufacturers also was confined to single tools.

The week's inquiries are reported to be very satisfactory, both as to volume and nature. The great majority of these came from general machinists and miscellaneous users, located in all parts of the country, and were in regard to single items. Inquiries from concerns in the automotive industry and from the railroads also were confined almost altogether to single tools.

NEW ENGLAND

A quietness, which has prevailed more or less in the New England machine tool market for the past two weeks, is still a pronounced feature. In some sections, however, there are evidences of brisk business in all lines. Industrial conditions in southern New England are very satisfactory and include large contracts for parts from the aeronautical industry and electric refrigerator builders.

Massachusetts industry is not so well balanced. During the week, however, a textile company was in the market for a fair amount of machinery placed with two Worcester concerns. A Holyoke paper manufacturer plans to purchase machinery running well into six figures. Power interests in the state will be active buyers for large power projects in New Hampshire.

The Boston Schoolhouse Department has a large list of manual training items, including several lathes. Similar requirements involve the cities of New Bedford, Fall River, Worcester and Westfield, representing prospective business in good volume. A Windsor (Vt.) foundry is in the market for a 5-ton traveling crane. A Connecticut lathe manufacturer has recently received one of his best orders of the year and anticipates more business from the same source.

The New England section has been affected by a decline in buying on the part of the automotive industry. Expansion is a prominent feature in the aeronautical industry and machine tool requirements from this source are expected to produce an active market.

CHICAGO

Reports from representatives of manufacturers of several lines of machine tools indicate that the month of June will show an excellent volume of business. Plants turning out milling machines, lathes and other standard tools have been kept busy for the last several weeks, according to statements may by their local agents, production in certain lines being on an exceptionally high plane. General machine tool business as reported by distributors and dealers is holding up well, and, while no especially large orders have been noted, the volume of trade for the last week has kept pace with that of the weeks immediately preceding.

Builders of farm implements and tractors still are buying for shop equipment necessities, but the machinery trade is now turning toward industrialists and machine shop operators for the bulk of such business as may be looked for in July and August. There is little railroad buying at this time. The closing of a number of items still outstanding on old lists, that of the Santa Fe in particular, is expected from week to week.

Baldwin Locomotive Works Goes to Eddystone

After being located in Philadelphia for nearly 100 years, the Baldwin Locomotive Works has moved its entire plant to Eddystone, Pa., the station being known as Baldwin. Although the transfer from Philadelphia to Eddystone has been going on for approximately ten years, the last of the moving is of recent date, and the official exercises are being held today, June 28, at Baldwin. Samuel M. Vauclain, president of the Baldwin Locomotive Works, invited members of the Mechanical Division of the American Railway Association in convention at Atlantic City to be his guests on a special train to Baldwin, via Philadelphia. The invitation included members, their families and guests. The new plant at Baldwin gives greatly increased facilities for the economical building of modern locomotives and is free from many of the handicaps inherent in a location in the heart of a great city.

The American Machinist has an inquiry for bound volumes including all issues from the first, beginning with the issue of November, 1877, to the present.

If you have a complete set or part of a set available will you communicate with the editor, listing the volumes available and stating the price that you will accept?

Brown-Boveri to Dispose of Shipbuilding Interests

The American Brown Boveri Electric Corporation is negotiating for the sale of its extensive shipbuilding business at Camden, N. J., to the recentiy organized Transoceanic Corporation, formed by Laurence R. Wilder, a Brown Boveri director, for the purpose of operating a fleet of fast liners between Montauk Point and Europe.

The Brown Boveri Corporation proposes also to dispose of its holdings in the Moloney Electric Company, which has plants in St. Louis and is controlled by Brown Boveri.

Mr. Wilder asked the United States Shipping Board for a loan of $94,500,000 as three-fourths of the amount necessary to build a proposed Blue Ribbon Line of six fast vessels to operate a four-day service from Montauk Point to Europe, the remainder of the capital totaling about $50,000,000 to be provided by private interests. The board took the application under consideration.

Foundry Equipment Orders Show Sharp Rise

According to figures released by the Foundry Equipment Manufacturers Association, the index of gross orders received in May was 335.6 as against 107.7 for April and 138.6 for March. About twenty companies reported. Incidentally, the C. O. Bartlett & Snow Co., one of the member companies, received in early June a contract for $700,000 worth of conveying equipment for handling sand, molds and castings for the Chevrolet Motor Company.

Lift Trucks to Be Standardized

Manufacturers of lift trucks and skids held a preliminary conference June 12, under auspices of the Division of Simplified Practice, Department of Commerce, for the purpose of formulating certain standards of dimension for hand and electric lift trucks.

The conference adopted two heights of 7 and 11 in., respectively, for lift truck platforms in the low position. A maximum width of 27 in. for the lift-truck platform was adopted as standard. It was voted that a minimum clearance between the under side of skid platforms and the top of lift truck platforms be ¾ in. After discussion in regard to the establishment of standard lengths of truck platforms, the conference voted to lay this matter on the table until the question of skid sizes has been acted upon by other interests.

The conference requested the Division of Simplified Practice to call a general conference of manufacturers and organized users on June 28.

Welding Society to Meet in Philadelphia This Fall

As in previous years, one of the features of the fall meeting of the American Welding Society, to be held in Philadelphia, October 8-12, is the exposition of equipment fostered jointly by this society and the American Society for Steel Treating. The exhibit will occupy all the floor space of the Exhibition Hall of the Commercial Museum, and it is expected that about 350 exhibitors will participate. The days during the exposition are now known as National Metal Week. Technical meetings of the welding society will be held at the Bellevue-Stratford Hotel in the mornings and at the exhibition hall in the afternoons of each day. The Steel Treaters and the Institute of Metals division of the Mining and Metallurgical Engineers also will hold simultaneous meetings.

Personals

E. J. KEARNEY, secretary and treasurer of the Kearney & Trecker Corporation, Milwaukee, sailed June 22 for Europe.

WERNER J. SWANSON, designer of the "Lever-Motor," is on a one-year leave of absence as chief engineer of the A. L. Powell Power Co., Inc., of Oak Park, Ill.

THOMAS B. FRANK, treasurer of the Cincinnati Planer Co., Cincinnati, has been elected a director of the National Association of Cost Accountants.

L. E. BUGBEE, formerly vice-president of the Cadillac Machinery Co., of Detroit, is severing his connection with the company. He has not announced his future plans.

CHARLES H. UPSON, formerly district manager for the Dodge Manufacturing Co., has joined the sales organization of the Chain Belt Co., of Milwaukee. His headquarters will be at Cincinnati.

A. B. BENSON has been appointed general manager of the Joseph Harrington Co., subsidiary of the Whiting Corporation, Harvey, Ill. The Harrington company makes automatic stokers.

ROBERT L. BROWNE, 1425 Statler Bldg., Boston, Mass., has been appointed Eastern district sales representative of the Swift Electric Welder Co., of Detroit. He will cover New York State and New England.

JOHN D. HURLEY, president, Independent Pneumatic Tool Co., of Chicago, will sail for Europe on July 12, visiting the company's foreign branches. He will return in September.

HYMAN BOTWINIK, of Botwinik Brothers, Inc., of New Haven, Conn., is leaving for an extended business and pleasure trip to Europe. He will visit England, France, Germany, Russia, Italy and other countries.

MERLIN A. CUDLIP has been elected a vice-president of the Packard Motor Car Co. He has been secretary for the past five years. Mr. Cudlip is probably the youngest major executive in the automobile industry, being 31 years old.

GEORGE SMITH recently joined the Hanson-VanWinkle-Munning Co., manufacturer of electroplating equipment, of Matewan, N. J., as vice-president. Since 1923, Mr. Smith has been vice-president and general manager of Roth Brothers & Co., of Chicago, makers of the Munning "Optimus" electroplating generator under contract to the Munning company.

DR. EDWARD DEAN ADAMS headed a group of engineers representing the national engineering societies who sailed June 22 for Antwerp to take part in the dedication of the American Engineering Memorial at the University of Louvain, July 4. The memorial, a clock and carrillon, was presented by the Engineering Foundation as a tribute to the engineers who died in the World War.

Business Items

The National Die Casting Co., 20401 Fenkel Ave., Detroit, has been incorporated to make die-casting machinery and tools.

The Gairing Tool Co., of Detroit, has moved into a new and larger building at 1635 W. Lafayette Boulevard. The building is modern in every respect and is completely equipped.

The Oliver Machinery Co., of Grand Rapids, Mich., has purchased the business of Butterworth & Lowe, of that city, manufacturers of band saws and quarry machinery, and will continue the line.

Wm. Robertson & Son, of Chicago, announce the removal of their office and factory to 1424 N. Halstead St., where the concern will manufacture and sell the "Jiffy" high-pressure lubricator.

Fire of undetermined origin destroyed the building and equipment of the Crown Machine Co., Indianapolis, June 18 with a loss of about $40,000, including valuable equipment.

The Osgood Co. and the Commercial Steel Castings Co., both of Marion, Ohio, have consolidated under the name of the Osgood Co. Both plants are now operating at full capacity.

The Invincible Metal Furniture Co., Manitowoc, Wis., is preparing to build all-metal aircraft. A one-story addition, 86x335 ft., is being built to take care of this production.

The Michigan Tool & Die Co., Adrian, Mich., has been incorporated as the Oro Manufacturing Co. It will make castings, patterns, tools and dies, particularly for experimental work.

The Jennison Machinery Co., of San Francisco, has acquired the local division of the Smith Booth Usher Co., located at 40 Fremont St., dealer in machine tools, woodworking machinery and construction equipment.

The Joslyn Manufacturing and Supply Co., an Illinois corporation, has qualified to do business in Indiana. William E. Lowe, Fort Wayne, has been named state agent for service of process. The company will buy and sell iron, steel, copper.

The Stanley Works, New Britain, Conn., at a recent meeting of the board of directors, declared dividends on both the preferred and common stock. Common stockholders of record June 16 will receive a 2½ per cent dividend on July 2. Preferred stockholders of record August 4 will receive a 1¾ per cent dividend on August 15.

The Crawford & McCrimmon Co., of Brazil, Ind., manufacturer of woodworking machinery, has been sold by David W. Wood, receiver, to Mayer Brothers, a Wisconsin organization, which is planning to put the factory in operation shortly. Work has already been started on repairing the machine shops and foundry buildings.

The Roller-Smith Co., manufacturer of electrical measuring instruments and circuit breakers, announces that John A. Coleman, 1006 Washington Ave., Houston, Tex., is covering the Texas territory, and H. T. Weeks, U. S. National Bank Bldg., Denver, Colo., the states of Colorado, Utah, Wyoming, and northern New Mexico.

The Torrington Co., Torrington, Conn., at a meeting of the board of directors voted to recommend increasing the number of shares from 280,000 to 560,000. Shares at present par value $25 will be declared of no par value. Two shares of no par will be issued for each share of $25 par value stock. The latter amounts to $7,000,000. The financial change is subject to approval of stockholders.

Purchase of the Northwestern Malleable Iron Co., of Milwaukee, by the Rockford Malleable Iron Works, of Rockford, Ill. is announced by W. A. Forbes, president of the Rockford company. The two plants will be consolidated as the Rockford-Northwestern Malleable Iron Co., with a production of 40,000 tons annually. The plant and site of the Northwestern concern were reported last week to have been sold to the International Harvester Company.

Official announcement has been made that by July 1 the office building of the former Haynes Automobile Co., at Kokomo, Ind., will become the home office of the Continental Steel Corporation, which will house all its office activities there. A lease for a period of fifteen years has been obtained. The Kokomo Steel and Wire Co., the Chapman-Price Steel Co., of Indianapolis, and the Superior Sheet Steel Co. of Canton, Ohio, are subsidiaries of the Continental corporation.

Control of the Lourie Manufacturing Co., Springfield, Ill., has been acquired by the O. C. Keckley Co., of Chicago, which is transferring the Springfield offices to its Chicago office but will continue manufacture of the Lourie line of hydraulic presses and install equipment for the manufacture of the Keckley water gages. H. M. Alkire, vice-president in charge of manufacture announced that new capitalization is contemplated and expansion of the Springfield unit will follow.

Net profits of the Keystone Steel and Wire Co., Peoria, Ill., for the 11-month period ending May 31, were $1,206,000 according to a statement issued by B. L. Sommer, chairman of the board of directors. This figure represented a $300,000 increase over the corresponding period the last fiscal year. Unfilled orders now on hand are 21 per cent greater than at the same time last year and June business will probably exceed June, 1927, by 30 per cent it is indicated.

The Isothermos Corporation of America, 11 W. 42nd St., New York, has been formed to manufacture to American standards the "Isothermos" railway journal box, featuring an automatic lubrication system, and now in use on over thirty European railroads. The officers are: Hubert E. Rogers, attorney, president; A. De Bac, chairman of the Societe Internationale Isothermos (of Geneva, Switzerland), vice-president; Dr. F. H. Hirschland, president of Metal & Thermit Corporation, treasurer, and F. O. Willhofft, secretary.

The Hill Clutch Machine & Foundry Co., of Cleveland, has made the following appointments in its sales organization: the James T. Gordon Co., 11 Park Pl., New York, will cover the metropolitan territory; L. F. Dolan, 27 Hancock St., Dorchester, Mass., the state of Massachusetts; T. L. Rose & Son, 1104 House Bldg., Pittsburgh, Pa., the Pittsburgh territory; A. E. Wollam, P. O. 1089, Kalamazoo, Mich., southern Michigan; and the McNeal Machinery Co., Joplin, Mo., will cover Kansas, Missouri and Oklahoma.

The Ames Shovel & Tool Co., at present consisting of seven plants in Maine, Massachusetts, Missouri, Pennsylvania, Indiana and Texas, will concentrate all manufacturing at two points, namely North Easton, Mass., which will be the main manufacturing plant, and at one western plants. Headquarters of the eastern executives now at Boston, Mass., will be moved to North Easton, and it is planned to build another large factory unit there to be utilized as a shovel plant. Other tentative expansion plans call for the addition of new lines of manufacture.

The Hart Carter Co., a merger of the Hart Grain Weigher Co., Peoria, Ill. and Pella, Iowa.; the Twin-City Separator Co., Minneapolis, and the Carter-Mayhew Co., Minneapolis and Winnipeg, Canada, has been incorporated under the laws of Delaware. A. J. Hartley, who has been head of the Hart Grain Weigher Co., will head the new company, which controls all basic patents on machinery to clean grain and will produce machines for handling grain. The new corporation has assets of $5,000,000, of which $1,358,000 are net cash assets.

Obituaries

NEFF E. PARISH, 65, founder of the Parish Manufacturing Co., of Reading, Pa., died recently in Berlin, Germany. The company made automobile frames and is now owned by the Spicer Manufacturing Co. Mr. Parish was a member of the Society of Automotive Engineers and the Carriage Builders' Association.

Forthcoming Meetings

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

Canada's Steel and Power Show. Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

National Safety Council. Seventeenth annual safety congress will be held in New York, October 1-5. Idabelle Stevenson, executive secretary, 1 Park Ave., New York.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Welding Society. Fall meeting and exposition, Exhibition Hall of Commercial Museum, Philadelphia, Pa., Oct. 8-12, in conjunction with "National Metals Exposition" of the American Society for Steel Treating. Miss M. M. Kelly, secretary, 29 West 39th St., New York City.

American Gear Manufacturers Association. Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

PRICES of the principal hot-rolled steel products hold at $1.85 per 100 lb., f.o.b., Pittsburgh, in large mill lots; $1.90 is quoted on third-quarter requirements. Despite firmness in finished steel, there is marked downward tendency in prices of pig-iron and scrap. Heavy melting scrap declined 25c. per ton at Chicago last week. Scrap brass and copper, on the other hand, are higher than a week ago, in New York market. Mill operations of the U. S. Steel Corporation are at 76 per cent of capacity, against 79 per cent last week and 78 per cent one year ago. This production decline, however, is seasonal. Steel sheet demand remains weak with no actual change in prices as quoted. Prices of imported wiping cloths advanced ½c. per lb. over the week end, at New York warehouses.

(*All prices as of June 22, 1928*)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.50	3.25	3.90*
No. 12	2.05@2.15	3.55	3.30	3.95*
No. 14	2.15@2.20	3.60	3.35	4.00*
No. 16	2.25@2.30	3.70	3.45	4.10*
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.55	4.00
No. 22	2.85@2.95	3.90	3.70	4.15
No. 24	2.90@3.00	3.95	3.75	4.20
No. 26	3.00@3.10	4.05	3.85	4.30
No. 28	3.15@3.25	4.20	4.00	4.45
Galvanized				
No. 10	2.90@2.95	4.10	3.80	4.25
Nos. 12 to 14	3.00@3.05	4.20	3.90	4.35
No. 16	3.10@3.15	4.30	4.00	4.45
No. 18	3.25@3.30	4.45	4.15	4.60
No. 20	3.40@3.45	4.60	4.35	4.75
No. 22	3.45@3.50	4.65	4.40	4.80
No. 24	3.60@3.65	4.80	4.50	4.95
No. 26	3.85@3.90	5.05	4.75	5.20
No. 28	4.10@4.15	5.30	5.00	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in., steel, butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in., steel, lap welded	48%	35%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.50
Tin, straits, pigs, New York			52.50
Lead, pigs, E. St. Louis	6.15	New York	7.75
Zinc, slabs, E. St. Louis	6.15	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	12.50	13.00	14.25
Copper sheets, base	23.50	23.50	23.25
Copper wire, base	20.12½	19.62½	16.75*
Copper bars, base	22.00	22.00	22.25
Copper tubing, base	25.00	25.00	24.75
Brass sheets, high, base	19.25	19.25	19.00
Brass tubing, high, base	24.12½	24.12½	23.87½
Brass rods, high, base	17.00	17.00	16.75
Brass wire, high, base	19.75	19.75	19.50

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	22½@24	24.30
Zinc sheets (casks).....	9.75@10.25	11.00	9.36
Solder (strictly).....	32.75	32.50	31@34
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade.....			68.50
Commercial genuine, intermediate grade.....			53.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.25
Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:			
Ingots..... 35.00	Electrolytic.. 37.00	Shot.....	36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....			52.00
Cold rolled nickel sheet (base).....			60.00
Hot rolled rods, Grade "A" (base).....			45.00
Cold drawn rods, Grade "A" (base).....			53.00
Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:			
Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	13.00 @13.25	12.00	11.75@12.25
Copper, heavy, and wire.	12.75 @12.87½	11.25	11.25@11.75
Copper, light, and bottoms	10.75 @11.25	9.75	10.00@10.50
Heavy lead.....	5.25 @ 5.50	5.25	4.50@ 5.00
Tea lead.....	4.00 @ 4.25	3.75	3.50@ 4.00
Brass, heavy, yellow.....	7.50 @ 7.75	7.75	7.25@ 7.75
Brass, heavy, red.....	10.00 @10.50	10.00	9.50@ 9.75
Brass, light.....	6.25 @ 7.25	6.25	6.25@ 6.75
No. 1 yellow rod turnings.	7.75 @ 8.25	7.75	7.50@ 8.00
Zinc.....	3.25 @ 3.50	3.25	2.87½@3.37½

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20.....	6.45	6.10	7.00
	Terne Plates—8-lb. Coating—Small lots—Per box			
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.15½	38.00 per M	.17
Sal soda, per lb.....	.02	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, per lb. in 1 to 4 bbl. lots.....	.11	.105	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal...?	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.			
Medium grade.....	31½%	35%	35%
Heavy grade.....	27%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.			
First grade.....	45%	50–10%	50%
Second grade.....	50%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.....	$0.0325	$0.0325	$0.0324
Cold drawn shafting....	per lb.....	.034	.034	.04
Brass rods.....	per lb.....	.17	.1675	.155
Solder (½ and ½).....	per lb.....	.3275	.3375	.41
Cotton waste, white....	per lb.....	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.65
Machine oil.....	per gal...	.30	.30	.33
Belting, leather, medium.....	off list....	31½%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$4.95	$5.13
*Emery paper.....	10.71	9.15	10.71
†Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.27	1.32
Cloth.....	3.10	3.05	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,	2.25@2.50	
Coke, prompt foundry, per net ton...	Connellsville,	3.25@3.75	
White lead, dry or in oil...	100 lb. kegs....	New York,	13.25
Red lead, dry.....	100 lb. kegs....	New York,	13.25
Red lead, in oil.....	100 lb. kegs....	New York,	14.75

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1⅛ and 1¼ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including ⅞-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Boston—A. Moretti, 30 Lovering St.—circular saw and table.

Mass., Boston—Schoolhouse Dept., City Hall—metal and woodworking machinery for Hyde Park high school, also shapers and tool room lathes.

Mo., Wellsville—Wellsville Fire Brick Co. —heavy duty lathe, 24 in. swing, 10 to 14 ft. between centers with steady and follow rests, also small and large face plates and chuck, quick gear change.

O., Columbus—Lindon Lumber Co., 1850 Denune Ave., D. Shade, Gen. Mgr.—planer, sticker, band saw, joiner, boring machine, universal woodworking machine, two rip saws and two cut-off saws.

Pa., Erie — Erie Foundry Co.—24 in. geared head engine, 18 in. lathe, 28 in. turret lathe, 24 in. shaper, horizontal boring mill, heavy duty radial drill, circular saw (cold cutting), and 2 ton electric crane.

Pa., Pittsburgh—Baltimore & Ohio R.R., Baltimore, Md., W. S. Galloway, Purch. Agt. —two drill presses for Glenwood shops here.

Ont., London—City Council—will receive bids soon for electric traveling crane to cost $10,000.

Opportunities for Future Business

Ala., Mobile—Louisville & Nashville R.R. Co., Louisville, Ky., plans the construction of machine and blacksmith shops, etc. here. W. H. Courtenay, Ch. Engr.

Calif., Burbank—Lockhead Aircraft Co., had plans prepared for a 1 story, 50 x 200 ft. addition to factory.

Calif., Long Beach—City plans the construction of a municipal garage. Estimated cost $150,000.

Calif., Los Angeles—Austin Securities Co., awarded contract for a 1 story, 90 x 200 ft. factory at 858 East 60th St. Estimated cost $50,000. Mason Mfg. Co., 448 South Alameda St., manufacturers of lamps, lessee.

Calif., San Francisco—Yellow Cab Co., 1290 Bush St., had plans prepared for a 3 story garage at Jones and Turk Sts. Estimated cost $300,000. Powers & Ahnden, 605 Market St., Archts.

Ill., Chicago — George Brumlik, 1031 North Shore Ave., had plans prepared for a 10 story, 80 x 150 ft. garage at 112-22 West Lake St. Hall, Lawrence & Ratcliffe, 123 West Madison St., Archts.

Ill., East St. Louis—East St. Louis Casting Co., R. M. Hill, Pres., 16th St. and Kansas Ave., is having plans prepared for the construction of a furnace factory at St. Clair Ave. and Alton St.

Iowa—State Highway Commission, Office of District Engineer, Ottumwa, will soon award contract for the construction of four mainentance garages, 30 x 85 ft. at Oskaloosa, 30 x 85 ft. at Washington, 30 x 72 ft. at Bloomfield, and 30 x 72 ft. at Fairfield, all 1 story.

Ia., Clinton—Kelly Mfg. Co., awarded contract for a 3 story, 82 x 160 ft. furniture factory.

Ia., Clinton—Lubbers & Bell Co., 200 North Second St., manufacturers of hardware specialties, awarded contract for a 1 story, 86 x 161 ft. factory. Noted June 21.

Ia., Shenandoah—Maintenance Supt., will soon award contract for a 1 story, 30 x 98 ft. maintenance garage.

Ia., Sioux City—William Lerch Estate, will build a 1 story repair and service garage at 420 Pearl St. Estimated cost $40,000. Barish Nash Motor Co., 720 Pearl St., lessee.

Ia., Waterloo—The John Deere Tractor Co., plans to expend $1,000,000 for first unit of plant to include 6 story, 100 x 260 ft. machine shop, three additional foundry and cleaning plants, etc.

La., Shreveport—H. Jordan, Giddens-Lane Bldg., awarded contract for a 3 story, 116 x 150 ft. garage and service building at Edwards and Fannin Sts. Estimated cost $75,000.

Md., Baltimore — United Railways Co., Continental Bldg., is having plans prepared for a 1 story, 190 x 400 ft. garage at Kirk and 25th Sts. W. H. Emory, Jr., 18 East Lexington St., Archt.

Mass., Attleboro—L. Balfour Co., County St., plans the construction of a 3 story jewelry factory, etc. Estimated cost $200,000. Architect not selected.

Mass., Dorchester (Boston P. O.)—Meisel Press Mfg. Co., 944 Dorchester Ave., awarded contract for a 1 and 2 story, 100 x 225 ft. factory on Dorchester Ave. Noted June 21.

Mass., Milton (Boston P. O.)—M. Greenspan, 333 Washington St., Boston, is having plans prepared for a 1 story repair and service garage at Granite Ave. and Adams St. Blackall, Clapp & Whittemore, 31 West St., Boston, Archts.

Mass., Somerville (Boston P.O.)—American Radiator Co., 129 Federal St., Boston, is receiving bids for a 1 story, 75 x 165 ft. addition to plant on Park St. Estimated cost $50,000. W. Dykeman, 10 Devonshire St., Boston, Archt.

Mass., Winchester—W. R. Marshall, 1 State St., Boston, is having revised plans prepared for a 2 story, 100 x 150 ft. repair and service garage on Church St. Estimated cost $100,000. J. Purden, 50 Congress St., Boston, Archt.

Mich., Detroit—General Motors Corp., General Motors Bldg., awarded contract for an 11 story, 210 x 255 ft. research laboratory at Cass and Baltimore Aves.

Mich., Ishpeming—Marquette County, F. Jenks, Clk., awarded contract for the construction of a garage. Estimated cost $75,000.

Minn., Duluth — Zenith Garage Co., awarded contract for a 1 story repair and service garage at Third Ave. E. and Superior St. to replace fire loss. Estimated cost $40,000.

Minn., Minneapolis—Lillie Motors Inc., 2628 University Ave. S.E., awarded contract for a 1 story repair and service garage. Liebenberg & Kaplan, 617 McKnight Bldg., Archts.

Mont., Butte—Patterson Motor Co., J. G. Patterson, Pres., awarded contract for a 1 story repair and service garage at Second Ave. S. and Montana St. Estimated cost $25,000.

Mo., Fulton—Missouri School for Deaf, H. E. Day, Supt., will receive bids until June 29 for 3 story, 48 x 98 ft. manual training shops. Estimated cost $45,000. C. A. Smith, 800 Finance Bldg., Kansas City, Archt. Noted June 21.

Mo., St. Louis—Syndicate, c/o Jost-Miller Real Estate Co., 113 North Tenth St., is having preliminary plans prepared for the construction of a 5 story, 108 x 130 ft. garage at Ninth and Chestnut Sts.

N. J., Elizabeth—American Copper Products Corp., Bayway, is having plans prepared for a 1 story, 105 x 480 ft. factory at Amboy Ave. and Laurel St. Estimated cost $80,000. Wigton-Abbott, 705 Park Ave., Plainfield, Archts.

N. J., Newark — Radio Tube Corp., 88 8th Ave., will build a 3 story factory at 57-59 State St. Estimated cost $60,000. Siegler & Greenberg, 164 Market St., Archts.

N. J., Newark—Turner Machine Co., 28 Eagle St., awarded contract for the construction of a 1 story, 60 x 100 ft. machine shop. Estimated cost $40,000.

N. Y., Brooklyn—Ugast Realty Inc., J. Miller, Pres., 11 West 42nd St., New York, had plans prepared for a 100 x 100 ft. garage at Lexington and Nostrand Aves. Estimated cost $60,000. M. Klein, 65 Court St., Archt.

N. Y., Long Island City—New York City, c/o B. M. Patten, Queens Subway Bldg., Borough Pres., had plans prepared for a 100 x 200 ft. garage and shop. Estimated cost $100,000. J. F. Perrine, 31-35 Buell St., East Elmhurst, Archt.

N. Y., Niagara Falls—Carborundum Co., will soon award contract for a 5 story, 81 x 224 ft. factory. L. J. Call, Engr.

N. Y., Port Washington — Purty Boat Works, N. Purty, Pres., Bayview Colony, awarded contract for boat works. Estimated cost $150,000.

O., Cleveland—Federal Foundry Supply Co., R. Ditty, Pres., 2639 East 79th St., had plans prepared for a 1 story, 90 x 260 ft. factory at East 71st St. and Belt Line R.R. Estimated cost $150,000. E. A. Weiland & Co., 2725 Pittsburgh Ave., Archts.

O., Cleveland—Hertner Electric Co., A. Hertner, Pres., 1905 West 114th St., awarded contract for a 1 story, 100 x 240 ft., shop, etc. on Elmwood Ave. Estimated cost $75,000.

Tex., Beaumont—Beaumont Import & Export Co., J. O'Shaughnessy, Mgr., 401 Perlstein Bldg., awarded contract for a lumber mill. Estimated cost $80,000. Noted June 14.

Wis., Appleton—Appleton Machine Co., will soon award contract for a 1 story, 80 x 100 ft. foundry on Oneida St. W. F. Dolke, 1841 Ashbury Ave., Evanston, Ill., Engr.

Wis., Milwaukee—Dept. of Public Works, will receive bids until June 29 for a 2 story, 100 x 140 ft. repair shop on Virginia St. Estimated cost $94,000. Private plans.

B. C., Vancouver—Bd. of School Trustees, voted $195,000 bonds for addition to technical school including shops, auditorium, etc. at Broadway E. and Clinton St., H. W. Postle, 590 Hamilton St., Archt. P. P. Brown, 407 London Bldg., Engr.

Ont., Peterborough—Canadian General Electric Co., 212 King St., W., Toronto, plans a 2 and 3 story, 100 x 328 and 90 x 100 ft. addition to plant here. Estimated cost $300,000. Private plans.

Ont., Welland — Welland High School Board, A. B. MacLean, Chn., will receive bids until July 3 for the construction of a 3 story technical school. Estimated cost $175,000. N. A. Kearns, Temple Bldg., Archt.

Que., Buckingham — McLaren Lumber Mill Co. Ltd., plans the construction of a mill. Estimated cost $100,000.

Que., Cap de la Madeleine—National Forest Products Co. Ltd., c/o Canada Power & Paper Co. Ltd., plans the construction of a factory. Private plans.

Sask., Regina—General Motors Co. of Canada, Oshawa, plans the construction of a 400 x 800 ft. assembly plant, 50 x 260 ft. office, etc., here. Estimated cost $1,000,000. Hutton & Souter, 6 James St. S., Hamilton, Ont., Archts.

Sask., Saskatoon — General Motors of Canada, Oshawa, Ont., is having plans prepared for a 2 story motor assembly plant here. Estimated cost $150,000. Hutton & Sauter, 6 James St. S., Hamilton, Ont., Archts.

Chile—Electro-Siderurgical de Valdivia, Valpariso, awarded contract for rebuilding plant for electric smelting at Port Corral, 100,000 ton annual capacity, also construction of a 30,000 hp. power plant at Valdivia Lake in Andes Mts. to J. G. White Engineering Co., 43 Exchange Pl., New York, N. Y. Estimated cost $6,000,000.